THE MODEL ENGINEER

Vol. 96. No. 2393 THURSDAY APRIL 3 1947 9d

THE MODEL ENGINEER

Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2

SMOKE RINGS

Our Cover Picture

SPRING will be doubly welcomed this year, after a winter of abnormal rigour, and of all branches of the model engineering fraternity, none will hail the return of fair weather more gladly than the model power boat enthusiasts. Many boats are now emerging from their long hibernation, and are being prepared for an active open-air life in ponds all over the country. Our picture is based on a photograph taken at a meeting of a South Coast model power boat club, and shows a very smart steam-driven model about to start on a cruise.

A Model to the Rescue

DURING the recent coal crisis many temporary power plants were rigged up to maintain a supply of electricity for industrial needs. But the honours of this rescue service were not restricted to plants of larger growth. Here is the story of a model showman's traction engine belonging to a member of the Malden Society, Mr. Ernest Baughen, which nobly did its stuff, and once again proved the many sided nature of the virtues of model engineering. Mr. Baughen writes :—" I would like to tell you how models have come to the rescue during the present coal crisis. The firm at which I am employed are fortunate in having a Crossley gas engine to drive most of the plant, and although we have a few gas lights about the place, we found we had not enough for our purpose, the machine shop in particular being lit by electricity. As in most works, an emergency meeting of all hands was called, and suggestions were invited. The main thing was—light for the miller, a couple of drills and the planer. First of all, car batteries were thought of, but ruled out, on account of recharging. Then I had my bright idea. I have a 2-in. scale showman's traction engine nearly complete, which, as is usual, has a large dynamo fitted on the smokebox, so why not use that? So without more ado, it was fetched from home, bolted up on a beam, a belt from a pulley on the shafting, and away we went, four car bulbs, 12 volt, 24 watt. We had light. But the tale doesn't finish there ; a local wood log merchant had heard of my engine and called and asked if it would drive his saw. Now this engine is not yet complete, although the motion and boiler is finished, and as it had only been run for about 15 mins. from a stationary boiler, I was naturally a bit dubious about doing this, and explained it all to the log merchant, but said if he was willing to chance it, then so was I. So the engine was taken to his yard early on Saturday morning ; a gas burner rigged up in the firebox, steam raised to 80 lb. and with a Heath Robinson arrangement of belts, away went his saw. The engine then ran for 5 hours with one stop, and on Sunday ran for 7½ hours with one stop, and I found that 60 lb. of steam was plenty, and for those who are interested

CONTENTS

Vol. 96 No. 2393
APRIL 3rd, 1947

the size of the two cylinders is $1\frac{3}{8}$-in. bore × $2\frac{1}{4}$-in. stroke. In concluding this epistle, I think I can say 'Models to the rescue!'" Congratulations, Mr. Baughen, on your fine effort. Readers may remember that during the war years we published a description of a log-sawing plant driven by a model traction engine, built by Mr. C. E. Shackle. So history repeats itself, even in model engineering!

The British Industries Fair

THIS well-established trade Fair opens in both London and Birmingham on May 5th. The Birmingham section will be at Castle Bromwich, and will contain a splendid array of engineering and hardware exhibits, many of which will be of much interest to model engineers in search of either prototypes or workshop equipment. In London there will be two sections at Olympia and one at Earls Court. The Olympia show will include scientific and optical instruments, photographic goods, clocks, and toys of all kinds. At Earls Court the exhibits will be mainly textiles and plastics. Altogether fine displays of British industry at its best.

Encouraging Youth at Dudley

THE formation of a new society at Dudley is characterised by a keen desire to extend encouragement in craftsmanship to the younger generation. In the words of the Hon. Secretary: "The whole idea of this society is to endeavour by the efforts of a few qualified people to revive in today's generation of youth that instinct for craftsmanship which is rapidly dying out in this mechanical age." In addition to model railway lay-outs, the society will cater for all who are interested in aircraft, boats, and cars. The address of the Hon. Secretary is: Frank G. M. Wallace, 9, Ednam Road, Dudley. With such a high ideal before them, I wish our Dudley friends every success.

An Aeolian Harp

AS an example of the far-reaching interest of readers of THE MODEL ENGINEER, I have received a request for information about the construction and tuning of an Aeolian Harp, suitable for hanging under a tree in a garden. Quite a number of model engineers have applied their skill to the construction of organs, violins and other musical instruments, so why not an Aeolian Harp? This is a type of instrument which I believe releases pleasant musical strains through the operation of wind-power on its strings. We have no information in our office, but I am sure that among our readers there will be some who can either contribute a short article on the subject, or who can tell my correspondent where instructions can be found. The query at least conjures up thoughts that at some not too distant a date summer may come again to enable us to enjoy the pleasures of a garden, with sweet music to inspire our thoughts of lathe and vice.

A B.O.A.C. Models Society

THE British Overseas Airways Corporation has added to its other laurels by the formation of a model engineering society, based at Croydon. The works manager, Mr. H. S. Crabtree, is taking a personal interest in the new movement, and in addition to accepting office as Hon. President, has placed a room at the disposal of the members for use as a workshop and for meetings. I understand that several locomotives are in construction, and the other interests of the members include a model *Cutty Sark*, some racing cars, and a "OO"-gauge L.N.E.R. Pacific locomotive with super detail. The Hon. Secretary is Mr. F. H. Whitehead, B.O.A.C., Croydon, and he would be pleased to hear from any other employees of the Corporation who are interested in model making.

A Housing Problem

A READER sends me a problem which is not unlike that facing many thousands of other folk—he needs a house. His firm have recently transferred him to London, and his furniture and his workshop have been placed in store. He wants a home, preferably within 10 miles of Ruislip, and would much like the whole or part of an unfurnished house, to rent. Failing rental, he would consider buying a house, but this would involve the disposal of his much cherished 5-in. lathe and workshop equipment, and the cessation of work on a partly finished locomotive, a consequence which he would much regret. I know the housing difficulty well enough, but here is a model engineer in a difficulty, can any fellow reader help him out? If any replies are addressed to me, I will forward them to my correspondent, who will, I am sure, be most grateful for some practical suggestion.

An Old Locomotive for the Newcastle Museum

A LOCOMOTIVE which has been in continuous service for nearly seventy years, is to be exhibited in the Newcastle Science and Engineering Museum. It is an 0-4-0 Black-Hawthorne locomotive, the only surviving example of the earliest type of industrial locomotive designed by that company. It was built in 1874, and used at a works in Hebburn until 1943, when the works were closed and sold to Messrs. George Cohen, Sons and Co. Ltd., of London and Leeds, for dismantling and disposal. Messrs. George Cohen presented the engine to the North Eastern Historical Engineering and Industrial Society, who were anxious that it should be saved from the scrap-heap. It was still capable of pulling a substantial load. The makers, Messrs. Black, Hawthorne and Co., were a firm of Gateshead engineers, established in 1866. The business changed hands in 1898, and was eventually closed down in 1902.

Percival Marshall

*THE SHIP MODELLER at the SHIPWRIGHTS' EXHIBITION

By "JASON"

THE *Brier Holme* was built by Thompson's, of Sunderland, in 1876. She was an iron 3-m. barque of 920 tons (N.R.). My picture shows the main hatch and lower main-mast. There are a number of items of interest to windjammer modellers and it seems to me that the *Brier Holme* was an early windjammer, as distinct from the clippers. *First point* is the position of the lifeboats being on the for'ard house and not on the after skids, as was usually the case later. It will be noticed that the gigs are on the after skids and under the davits. *Second point*: deadeyes are still in use, but it is possible that the modeller has cut his shrouds and back-stays rather short with the consequently rather lengthy lanyards. *Third point*: the "back-aching" winch on the after end of the main hatch with the pump abaft the mast will bring back memories to the few windjammer men who may be readers but they, the winch and the pump, were very important details on a windjammer's deck and also therefore to be noted by modellers. The skids, i.e. the thwartship beams under the boats, were typical of all such right up to the end of the nineteenth century, although I have seen "T" iron skids. Keen-eyed modellers will note the absence of the running gear and fairleads on and above the pin-rail. One thing more; there is, in Liverpool, an enthusiast, and a shipowner too, who looks upon the *Brier Holme* as one of the loveliest ships that ever sailed the seas.

**Continued from page* 375, "*M.E.*," *March* 27, 1947.

On Doxford's stand I noticed a bone model of H.M.S. *Victory* as she was rigged at Trafalgar. This is a contemporary model made by French prisoners-of-war in the vicinity of Portsmouth, presumably at the Porchester camp close by. So far as the rigging goes in detail, craftsmanship and scale, it is one of the finest models I have seen, though the rest of the model, such as hull, deck details, etc., fall short of some other contemporary models I have seen. Sunderland and district modellers therefore who are interested in this period (*c.* 1805) rigging would do well to study the model for tips and details. I feel sure that Messrs. Doxfords would welcome serious students. The scale is to $\frac{1}{8}$ and I believe the model was made under the direction of Portsmouth dockyard officials.

The next model which caught my eye was certainly one of the most interesting models I

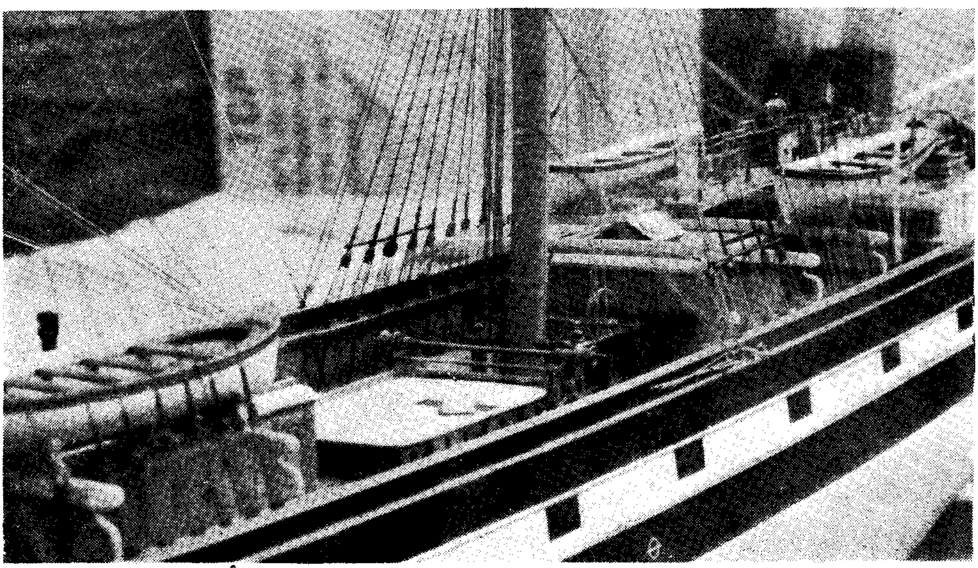


Photo by] [*M. B. Craine*

The 3-masted barque "Brier Holme" (iron) and less than 1,000 tons register. Picture shows the main hatch and adjacent fittings. Note pump and winch (hand powered). This is one of the early windjammers. Built in 1876 by Thompson's, of Sunderland, a builders' model

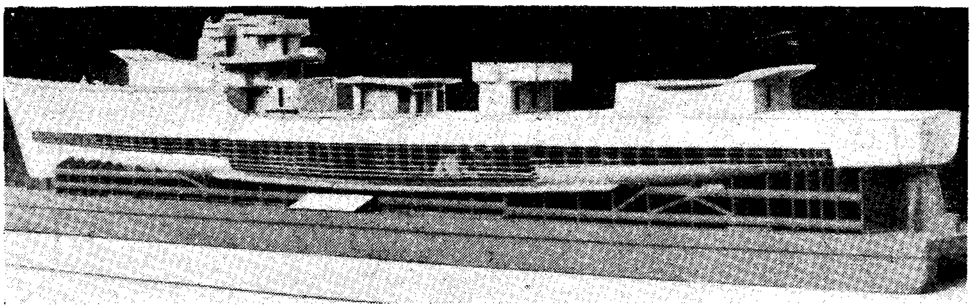


Photo by] [*M. B. Craine*
A demonstration and working model of H.M.S. "Contest." Welded construction and mass-production, a product of J. Samuel White's yard at Cowes. Units up to 10 tons in weight were welded in convenient bays and subsequently the units were welded together on the ways

have seen and permits us to glance behind the secrecy curtains of the last war. This is the demonstration model of H.M.S. *Contest*, on the stand of J. Samuel White & Co. Ltd., of Cowes. Towards the end of the war the Admiralty turned their attention to mass-production of welded destroyers. White's was one of the companies selected for the preparatory work and they were getting into the swing of it when the war came to an end.

Broadly, pieces of destroyer up to 10 tons in weight were welded together in any convenient place, then brought to the assembly point and piece-to-piece were welded into the whole. Well, perhaps there's not much of startling interest in that, but the model consists of the 10-ton pieces easily assembled and broken down again and was used for demonstration purposes to the yard foremen and section-leaders.

One of the photographs shows the model as a whole resting on the ways and the other shows the midship part with a 10-ton piece alongside resting on its end.

Four vessels were built of this class, the first of them being H.M.S. *Contest*. A number of modellers expose part of the interior of their model to demonstrate the method of construction. Maybe this will provide new ideas.

A model of great interest to all those who used *Mulberry Harbour* on their recent trip to the

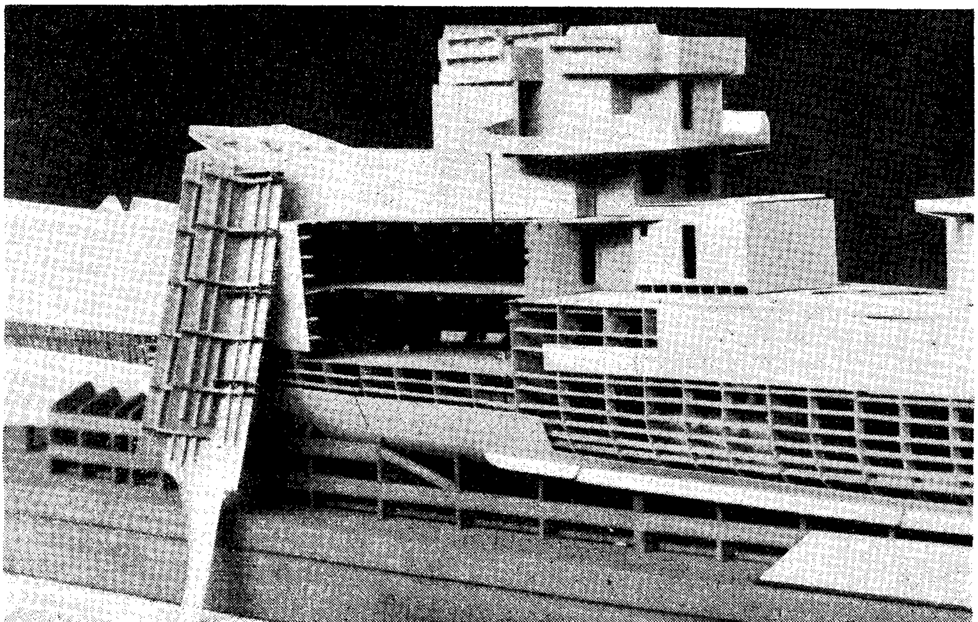
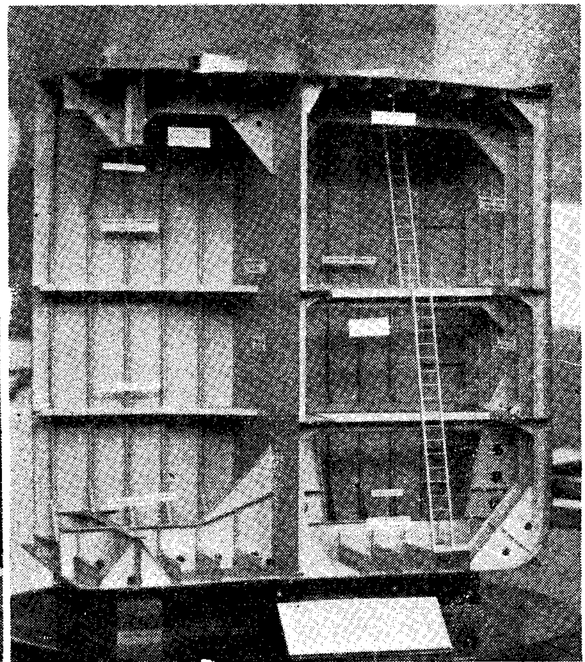


Photo by] [*M. B. Craine*
H.M.S. "Contest." Picture shows one of the 10-ton units on end. The units of the model were held together by "pins and eyes"

Continent was the *Lucayan*. Quite insignificant she looked. She is technically known as a dipper-type dredger, and is three times the length of a ship's lifeboat. She requires no mooring anchors when working, but just plants her three legs on the bottom like a Manxman and scoops up 10 tons at a time. She has no propelling machinery but, with the intelligent use of her bucket, plus the somewhat loose hind leg, can propel herself to a new area of operation. The type is not new (although it was to me



[Photo by M. B. Craine

The interior appearance of a modern Tanker.—A model shown by Lloyds. Each part was labelled with its name. This picture of rather more than half the beam of the ship, is shown as a stimulus to those who are toying with the idea of a "frame and plated" hull for their next model

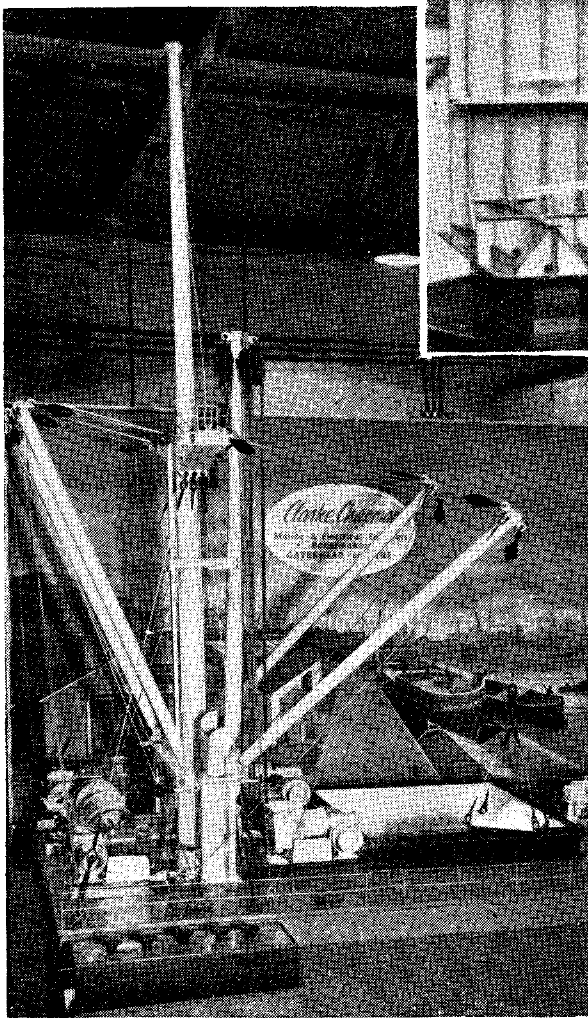


Photo by courtesy] [Clarke Chapman and Co. Ltd.

A suggestion for power boat men. Why not a Merchant Navy cargo vessel? Here's a good mast rigged up to date, complete with winches, mast-house, ventilators, runners, gin blocks, and a host of other details. On a free-lance model fit as much as or as little as you like

personally) and has been in use for more than twenty years. The *Lucayan* was the prototype for the *Mulberry Harbour* sections which planted their legs so firmly on the bottom off the coasts of Normandy. Surely the *Lucayan* is worthy of the modeller's attention. I feel sure the builders, Messrs. Lobnitz & Co. Ltd., of Renfrew, would be glad to help.

I must hand out a meed of praise to a professional modeller, Mr. Mills (of Ruislip) for his good piece of woodwork on a model of a lifeboat built by Messrs. The Rowhedge Ironworks, Colchester. This boat is one of the open type and has a wooden companionway and shelter for the engine. As readers know, the *Royal National Lifeboat Institution* always consult the crew concerning the type of boat required. The companionway is elliptically shaped and curved and made of quarter-inch strips (over a framing) of mahogany; a splendid woodworking job—and the rest of the

boat is to the same standard. This boat, now at Gadgwith, in Cornwall, has an interesting history. She was built by the pennies and shillings of the Girl Guides, and, while still being fitted out, was rushed off to Dunkirk to do a really good turn to some of the 400,000 men on the beaches. In a few days she was back again in the builders' yard for completion.

I secured a picture of the inside of a tanker showing the general appearance and construction by "frame and plate" of a steel vessel and its sub-division into various compartments. I show this picture here because I feel sure there is a growing demand or, I should say, a desire to construct a hull in metal in a similar manner to those who construct a wooden hull by "timber and plank."

In past years there have been a few models in "frame and plate" constructed hulls on show in THE MODEL ENGINEER Exhibition. Many of these were extremely well done. This picture therefore will convey to novices and even experienced modellers some idea of the work entailed and the results when constructing a "frame and plate hull." It will not be necessary for me to say that you will require much more than this picture to start on such a job—still the photograph may stimulate the desire.

While on the question of stimulation of ideas, here's another one for "power boat men." Through the courtesy of Messrs. Clarke Chapman & Co. Ltd., of Fenchurch Street, E.C.3. I reproduce their picture of their stand at the Shipwrights' Exhibition. Dominating the whole was the typical mast and derricks of a cargo ship. Not many people show the humble merchant carrier on our "waters" and ponds. Personally I feel that such a rig would attract some attention. Apart from this, the rigging is quite simple with much scope for craftsmanship and even artistry. The "Jumbo," which is the sailor's name for the very heavy-work derrick seen "up and down" against the mast, may be omitted. Finally, I think that a few "tramps" among the power boats would be some sort of salute to the wartime work (aye, and peacetime work) of the Merchant Navy. It has been said that power boat men do not bother to rig their vessels. I know that this is a wild statement, but still there's always scope for more variety.

I never expected to see the day when modellers might have to wrap up the deckwinches in cellophane paper, but look at the photograph of one of Clarke Chapman's new winches. It is a silent, totally-enclosed steam winch and is being fitted on a number of our cargo and passenger liners. The transparent material is perspex and as well as being silent it also keeps the lubricating oil under control. Strange how the general outline and profile of steamer winches seems to alter very little in almost half a century. Nor for that matter has the windlass altered very much, which reminds me that I was surprised to meet a keen shiplover at the Exhibition who was hazy about the difference between a winch and a windlass. So far as the sea is concerned, the windlass lifts the anchor—but by messengers a winch could also be used for the same purpose.

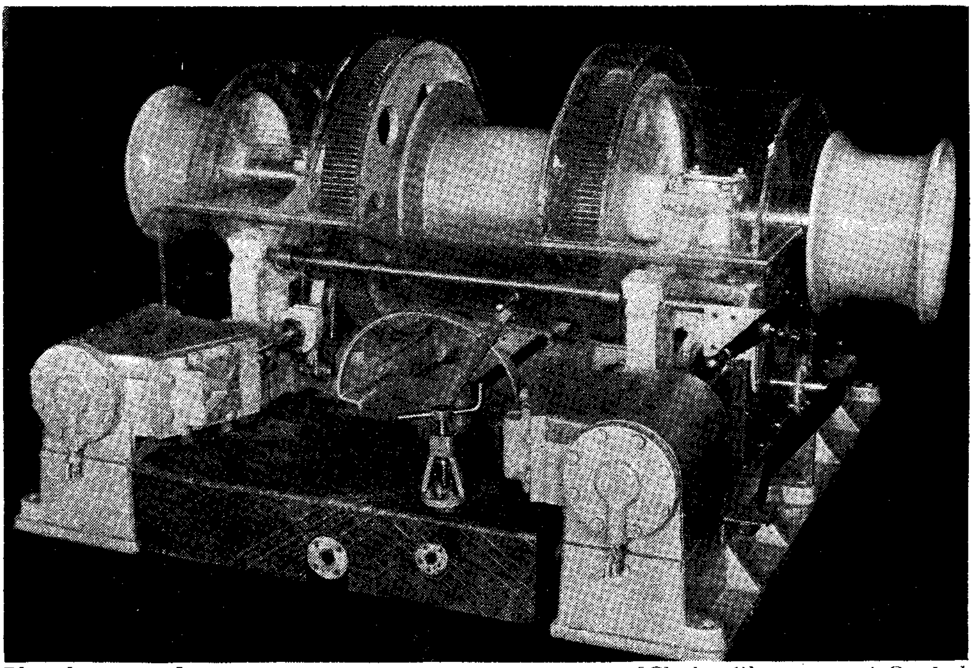


Photo by courtesy] [*Clarke, Chapman and Co. Ltd.*

The modern winch for cargo liners. Enclosed in perspex for cleanliness and elimination of noise. Not an experiment, but normal practice in some cargo liners

ADAPTABLE FIXTURE AND SIMPLE PRECISION PACKINGS

By Niall MacNeill

THERE is, perhaps, no item of workshop equipment the construction of which has been more often described, or sale more widely advertised, than the small machine vice. Its usefulness is unquestionable, and its adaptability extensive, yet jobs often turn up of a kind which, while they suggest the use of such a mounting, are unsatisfactorily accommodated by it. Where it is required to fix securely work-pieces having faces so small or shallow that they are awkward to hold in the machine vice, or which the moving jaw of the latter may tend to tilt off the flat, the simple fixture and method of packing described herein may be found to solve the problem, and the packing method itself may prove to enhance the versatility and ease of application of the conventional machine vice or toolmakers' vice clamps.

approximate dimensions—even a solid slab, though in that case involving the labour of machining out the trough. There is also an obvious choice, presumably depending on equipment, in the method adopted for machining the various work-faces of the contraption. The photograph (Fig. 1) is largely self-explanatory.

It was only after its construction that the wide versatility of this simple gadget was fully appreciated. It can be mounted on planer, shaper, miller, lathe or drilling machine, either on its own base, or on an angle-plate or vertical slide. Slots, slits and tapped holes, or vees if required, can be provided in it as the work occasions, many such modifications being applicable without unduly weakening the principal structure—a kind of adaptation which one would hesitate to apply to the vice. Thus, up to a limit, it

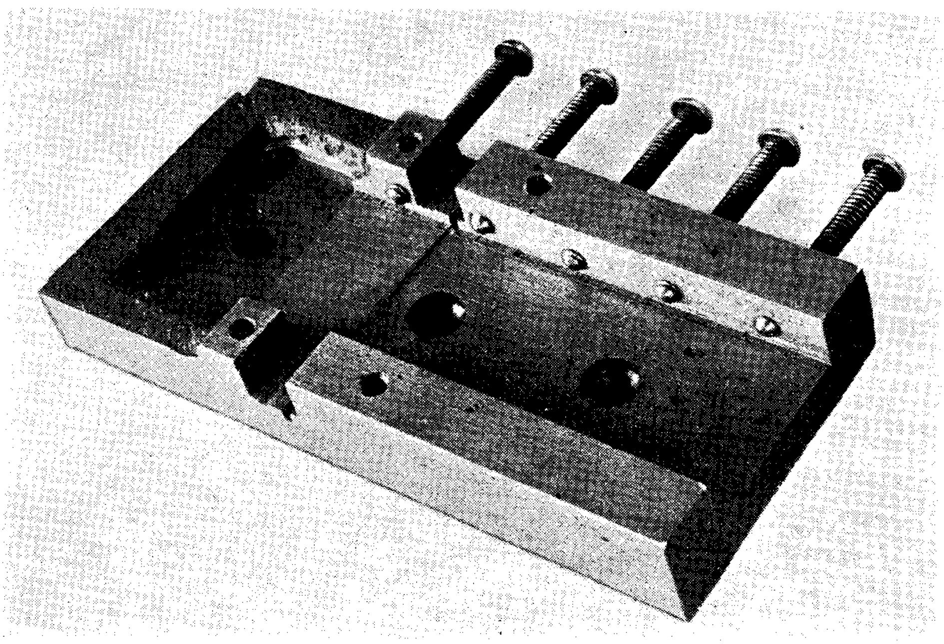


Fig. 1. The fixture

The Fixture

becomes a more versatile tool the more it is used.

As shown by Fig. 1, this consists of a trough-shaped casting. One about 5 in. long × $2\frac{1}{2}$ in. wide × $\frac{7}{8}$ in. deep overall happened to be available (a spare made from the pattern for the top-slide described in my article on "Lathe Improvements"—THE MODEL ENGINEER, August 29th, 1946, p. 210). The dimensions are, however, by no means critical. The device could be made from any chunk of iron, steel or brass of widely

The base should be machined first, followed by the bottom and sides of the trough, taking care to make the sides perpendicular to the base and providing narrow dirt or clearance channels in the corners.

"Fixing the Fixture"

The means of fixing it to machines calls for special comment. The projecting lugs on machine

vices often come in the way ; in fact, such fixtures may be generally criticised on the score of the large machine-table space they require in proportion to the size of work they will accommodate. The shape of the casting suggested that the fixing holes should be within the body of the appliance. Two holes are therefore drilled and countersunk or counterbored for securing it to T-slots by means of countersunk or cheese-head screws and special T-bodied nuts of the kind shown by Fig. 2. To provide, however, for the case in which a heavy cut might shift such a fixing, one plain hole for use with an ordinary T-bolt and nut is provided, in line with the other two. The holes should be spaced apart at distances which coincide with the separation of the T-slots in the machines

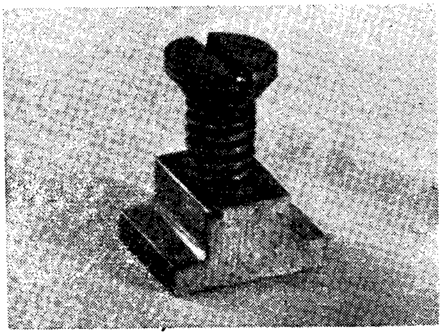


Fig. 2. A special T-bodied nut

n use, and if these vary, the plain hole and/or one of the counterbored holes may be extended into slot form. In most cases, two screws will suffice for fixing ; this allows that the fixture may, if required, overhang the machine table, and the third hole occasionally comes in handy for fixing work stops. The only case in which this internal method of fixing may be inapplicable is that in which it may be required to shift the fixture without disturbing its contents, but even this is better catered for by the use of detachable clamps than by the provision of projecting lugs, which severely curtail choice in positioning and greedily consume available space.

"Reference" Faces

Finally, it will be well to machine at least one of the longer outer perpendicular faces, if not also one or both of the ends, making these surfaces truly parallel and at right-angles to the inner faces, having set the fixture up truly for that purpose by the aid of a dial test indicator or other means. This provision of external surfaces which are true with reference to the working faces or slide bearings of machine tools and attachments is a much-neglected means of securing accurate set-ups with ease and rapidity. An honourable exception to the neglect is Mr. G. P. Potts, who quite properly arranges—both in the finished article as supplied by him and in blueprints—that even the bases or mounting brackets of his milling-drilling spindles are machined in this manner.

In writing on lathe improvements, I pointed out the importance of correspondingly treating all or most of the outer surfaces of compound slide rests on small lathes. Granted this simple "improvement," as applied both to the machine and the "attachments," nine set-ups out of ten can be completed with adequate accuracy with no more trouble than merely abutting two faces or using a try-square to align them. Alternative expedients, in themselves relatively simple but often awkward to apply, such as abutting the job to the faceplate or setting it by reference to a true piece between centres, become unnecessary. In the present case, the setting used for providing these "reference edges" may also be used to machine the tops of the side walls of the fixture flat and parallel with the base.

Work-holding Screws

The work-holding screws may conveniently be $\frac{3}{16}$-in. Whitworth or B.S.F., or 2 B.A. Their points should be domed by chucking in the lathe and filing or use of a doming form tool. A second row of tapped holes for screws, somewhat higher above base than those shown in the photograph and "staggered" with reference to the latter, could also be provided. The opposed gaps in the walls allow for planing or side-and-face milling the ends of work-pieces and the photograph also shows a clearance slit provided for the use of a circular saw in cutting off inequalities in the ends of a number of components machined in the fixture. Both these provisions were made, not as designed preliminaries, but by sending the cutter through the fixture as well as the work on the first occasion on which the particular machining processes were required. Vertical holes—two

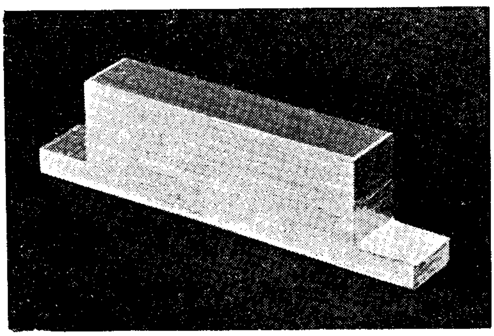


Fig. 3. A specimen of work—a petrol lighter component

pairs of which are shown—may be drilled and tapped in the walls for holding-down straps.

Type-metal Packings

The discovery—quite probably not original, but to which no other recent reference can be found—was made, that printers' leaden type is peculiarly adaptable to packing purposes. It serves admirably, not only for packing work up to height, but also for protecting it from indentation by the points of the holding screws, and for affording tool-clearance between shallow work and the sides of the fixture. It can, of course, serve the same purposes in conventional machine vices, and has, for example, been employed successfully in

toolmakers' vice-clamps in cases in which the loose jaws would otherwise give an insecure grip, or foul the tool or in which packing-up was required. It was found that where these pieces of type metal were of an apparent equal size, they in fact agreed with each other to well under one thousandth of an inch *even in specimens that had been subjected to considerable use for their proper purpose.* The spacing pieces, can be had as thin as 0.015 in., if not thinner, and sizes are available up to an inch thick and over. Even those with type faces, as distinct from spaces, can be used, and are generally equally uniform in dimensions.

If "odd" sizes are required, the stuff itself can be machined to such special dimensions with the utmost facility. It is possible, for instance, to lay a packing-up bed in the fixture, in a planer or shaper, and machine this bed itself to a predetermined height at one or two traverses. It cuts like butter, yet is strong enough to support work under quite heavy cuts, without distortion or lack of security. For the same reason it matters nothing if, when used as side-clearance packings, the pieces project above the work face. The tool simply goes through the projection as if it weren't there. Even after use, the stuff need not be consigned to the refuse bin, for in most amateur workshops, a job will soon turn up in which cast type-metal will serve some purpose—if nothing else than making vice clams superior to those made from common lead. As to supply, the local job printer may regard as an entirely negligible quantity what would be more than an ample stock for workshop purposes, and in any event, the scrap-metal merchant may be outbid without "financial embarrassment."

Specimen of Work

A simple example of the kind of work that can be done by these aids is shown photographically by Fig. 3. This little item (incidentally a component of THE MODEL ENGINEER Petrol Lighter) is of brass and only $\frac{3}{8}$ in. high × $1\frac{3}{8}$ in. long × 7/32 in. wide. It was made from a badly battered piece of $\frac{1}{4}$-in. thick stuff, being machined on all faces in the fixture. The results considerably exceed in precision the need of the purpose in view, yet without having involved the loss of time, which is invariably associated with the employment of unnecessary *finesse.* The component shown requires, of course, subsequent and finishing operations, but represents as it stands the kind of "blank" in which such finishing processes and precision in their application are reduced to the utmost simplicity. The photograph is an untouched one.

"Shifting Houses"

By W. G. Rowell

MR. W. R. ARMSTRONG'S article in the September 12th issue of THE MODEL ENGINEER was of great interest to me in that I also have, and am now going through, similar experience to that mentioned by Mr. Armstrong.

The first part of my story is, strangely enough, the same, only I shifted to look after the interests of my Company in South, East and North Scotland.

As in Mr. Armstrong's case, my new house has also turned out to be one in the country, situated on the northern side of the Tay, having plenty of buildings and elbow room. The house itself is a model maker's paradise inasmuch as I have two whole rooms to myself as a workshop and a cinema without in any way encroaching on rooms required as living and sleeping quarters.

The great drawback, as in Mr. Armstrong's case, is that I have only a 50-volt private lighting plant which is of no use for power purposes, consequently I also am going back to treadle operation.

In order to satisfy a constant urge to create things, I have started on the building of a 68-in. span petrol plane which, with the exception of the engine, can be made by hand tools alone. This type of modelling is a change for me, but I find it extremely interesting, and I am at no disadvantage to my town brother on this work, whilst I am at an advantage when it comes to actual flying.

As no gas is available, I found myself somewhat lost when I wanted to solder and sweat articles, but a search proved that a "Valor" blue-flame cooking stove is just the thing, and besides it is a grand workshop warmer.

It is quite true that "where there is a will there is a way," and I find that difficulties which at first appear unsurmountable, but after thought and perseverance they melt away.

The greatest difficulty I have so far come up against has been the working of my 250-volt a.c. talkie equipment, which uses quite a bit of current. The main 50-volt lighting plant has little to spare in the way of current, but the engine itself, I found, could take on extra work without in any way interfering with the normal output. A search of the local scrapyard brought forth a good bus dynamo, giving 12 volts at 15 amps, and this was rigged up on the far side of the plant and driven off the car engine flywheel. This charges a 12-volt car accumulator, which in turn operates a little rotary transformer giving 300 volts at 120 m.a. which looks after the amplifiers. The projector lamp is being replaced with a 50-volt type which will take its current from the main generator, and the projector motor will be replaced by a 12-volt high torque model.

I find that, although one is inclined to grumble at the loss of amenities that the town dweller has, the very fact of meeting and surmounting difficulty, brings with it great satisfaction.

Fortunate are those of us whose spare-time interests lie in model making and other scientific hobbies, as when forced to take up residence in localities off the beaten track we are still able to carry on in the old sweet way.

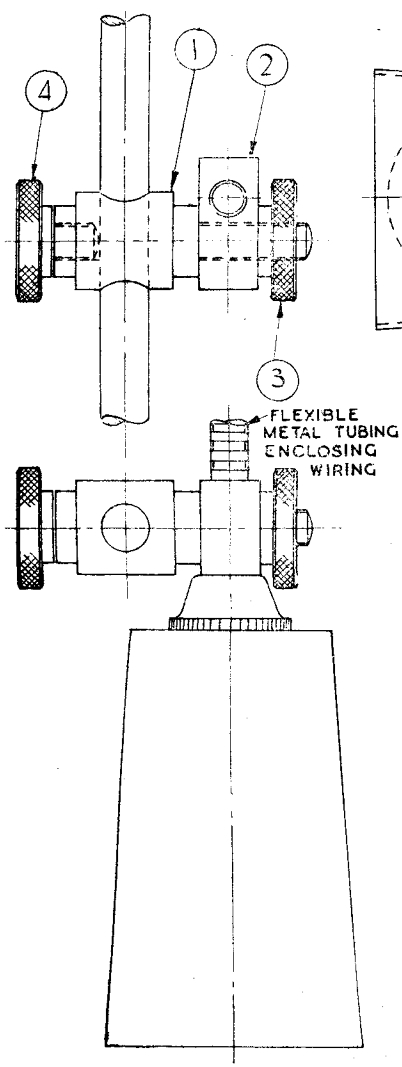
A LATHE SPOTLIGHT UNIT

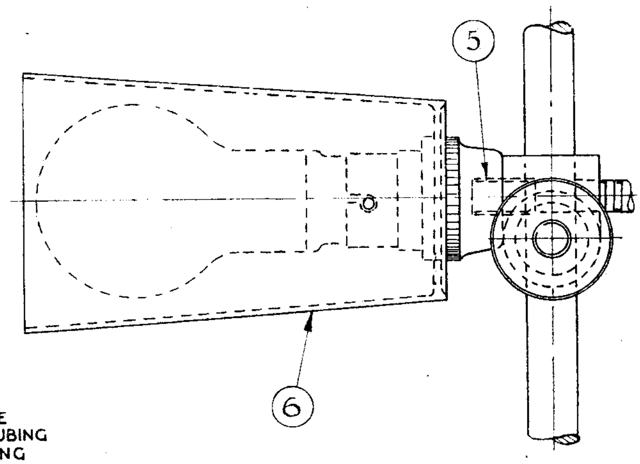
By "P.B.D."

THE accompanying drawings and photograph give a clear picture of a spotlight I recently fitted to my lathe.

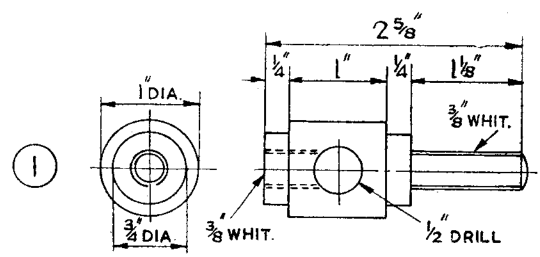
Some time ago I mounted the lathe on a specially-built bench and attached a separate drive, making the unit self-contained (this drive was recently described in this journal). The motive behind this was in the fact that the lathe bench was dependent only upon the electricity supply; it could be moved anywhere in the workshop or even into another room. At times when changing position of the bench the room lighting was found to be very unsatisfactory, and this called for a spotlight to be incorporated integral with the bench. The illustrations show the results which, I can say without hesitation, have proved very effective.

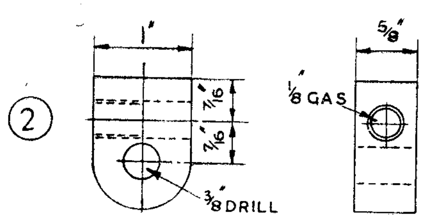
The main component takes the form of a universal joint carrying a lampholder which slides up and down the pillar. This pillar, which is of ½ in. diameter bright mild-steel, is carried from the back of the saddle of the lathe and therefore





Arrangement of spotlight unit

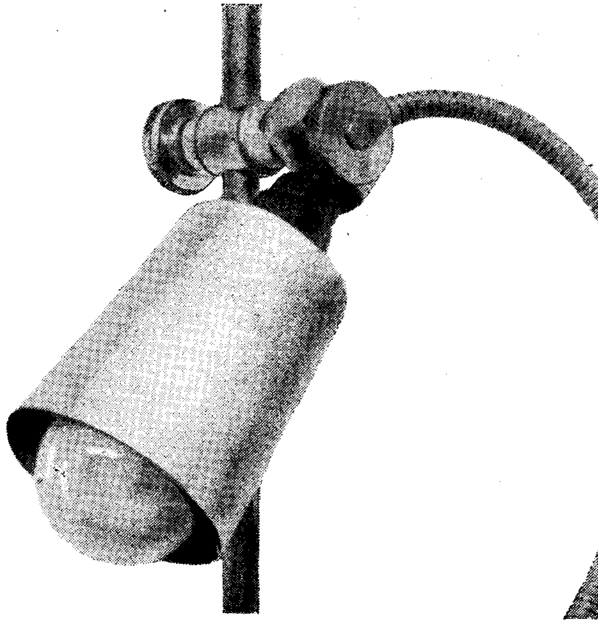




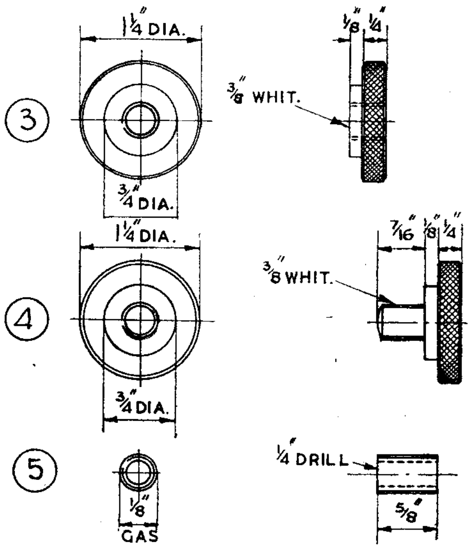
traverses along the bed with the tool. A knurled handwheel is provided to lock the up-and-down movement of this universal head. The lampholder is secured to the swivelling boss (2) by the screwed bush (5) which is locked by a knurled screw (3). The five parts (1) to (5) are made from duralumin bar.

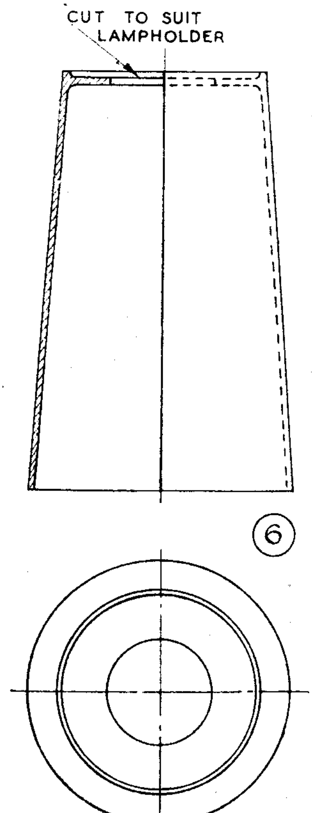
The wiring is rubber-covered enclosed in flexible metal tubing to protect it against oil, etc., as can be seen attached to the swivelling boss.

I had difficulty in finding a small electric light shade and, since the normal household variety was too cumbersome for this particular job, a makeshift arrangement had to be devised. Anyhow, these things are sent to try us, and eventually justice was done in purchasing a drinking tumbler of the so-called plastic material (6). This proved to be ideal in quality and appearance and, by cutting a hole in the bottom, it could be attached to the lampholder.



The various parts are detailed for those interested, although a description is unnecessary.

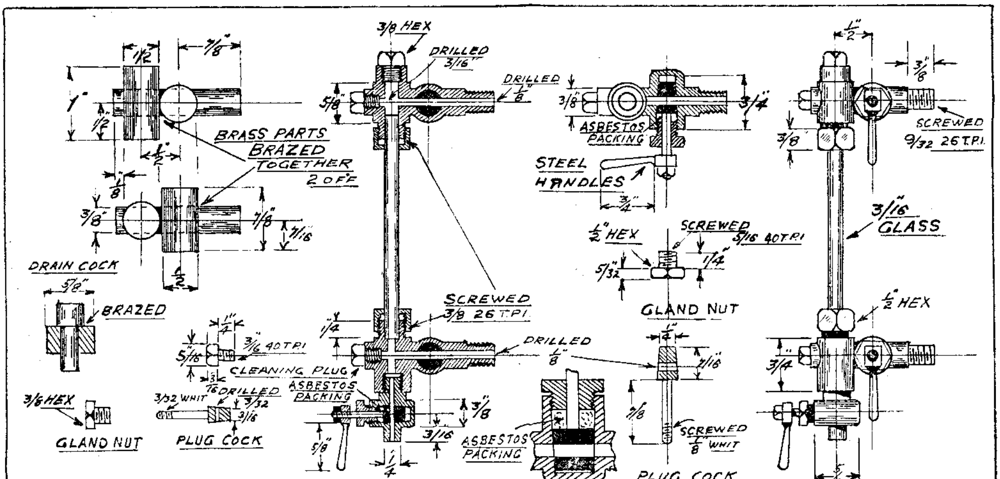




In conclusion, I might add that care and attention should be paid to insulation and connections if the mains supply is to be used; it is also an advantage to earth the metal part. In my case, the voltage is 230 and ample illumination is provided with a 15-watt bulb.

A Water-Gauge With Asbestos-Packed Cocks

By T. W. Geary



WATER GAUGE FOR SMALL POWER BOILERS FITTED WITH ASBESTOS PACKED COCKS FULL SIZE

MODEL water-gauges are generally fitted with plain plug-cocks which are liable to stick when working under steam. The gauge herewith described has asbestos-packed cocks, which gives freedom of movement. For packing the cocks, use asbestos string when cock is placed in position in tapered body; the asbestos string is wound loosely round spindle and tightened up by gland nut just tight enough so as to be able to move handle. The asbestos before placing in position should be soaked in oil, or, better still, a little graphite paste smeared on the string.

This gauge is built up from brass rod, no castings being used. Three pieces of brass rod are required to build up the bodies of the gauge; two pieces $\frac{1}{2}$ in. diameter are drilled through $\frac{3}{8}$ in. diameter and a piece of $\frac{3}{8}$-in. brass rod passes through the above two pieces which are set at right-angles to each other and then all are brazed together. The parts should be a tight fit when assembling, so as to keep their position when brazing.

These gauge parts can be quite easily held in the self-centring chuck for turning and drilling. The part for the taper plug is drilled and then finished with a suitable reamer. The end is faced and tapped $\frac{5}{16}$ in. 40 t.p.i. for gland nut; the part for fitting the glass is drilled right through $\frac{3}{16}$-in. diameter (for top fitting). One end is turned and screwed $\frac{3}{8}$ in. × 26 t.p.i. for packing nuts; the other end is opened out and tapped $\frac{1}{4}$ in. × 40 t.p.i. for the hex. plug screw. The part is reset in the chuck for turning the end which enters the boiler; this end is screwed 9/32 in. × 26 t.p.i. A $\frac{1}{8}$-in. hole passes right through and a cleaning-plug is fitted at the front end of the gauge; this is screwed $\frac{3}{16}$ in. × 40 t.p.i.

The two gland or packing nuts are turned, drilled and screwed $\frac{3}{8}$ in. × 26 t.p.i. from $\frac{1}{2}$-in. hex. brass rod. The plug-cocks are turned from phosphor-bronze rod, and after turning the cocks, these are ground into position with fine grinding-paste.

The hole through the cocks is drilled through from the hole already drilled in the body of the gauge.

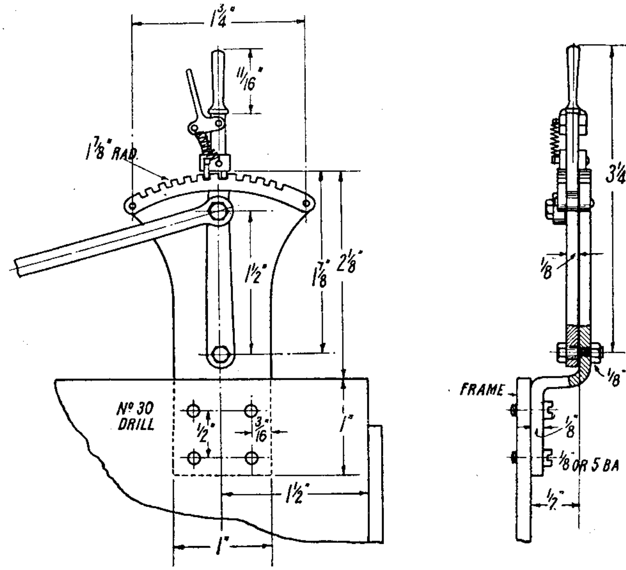
The gland-nuts are made from $\frac{1}{2}$-in. hex. brass rod screwed $\frac{5}{16}$ in. × 40 t.p.i. The handles are turned from $\frac{1}{4}$-in. square steel rod and drilled and tapped $\frac{1}{8}$ in. Whitworth for screwing to the spindle. The drain-cock is built up in two pieces from $\frac{3}{8}$-in. brass rod; one piece is shouldered down to $\frac{1}{4}$ in. diameter to pass through the other part, then both are brazed together. This can be held in the self-centring chuck for turning and drilling.

The cock is turned from phosphor-bronze. The handle is turned from $\frac{1}{4}$-in. square steel, drilled and tapped 3/32 in. Whitworth for the spindle. The gland-nut is turned from $\frac{3}{8}$-in. hex. brass rod and screwed 9/32 in. × 40 t.p.i.

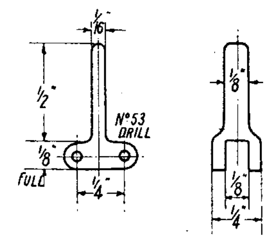
This gauge, when made, looks a real engineering job, and can also be made for 5/32-in. or $\frac{1}{4}$-in. glass by altering the sizes of gauge to suit requirements.

"L.B.S.C." DESCRIBES THE REVERSE LEVER FOR "JULIET"

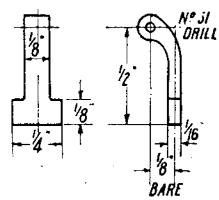
ABOUT the handiest form of reversing gear for a small tank engine like "Juliet," is the plain "pole" lever; and here, as promised, is a short illustrated description of a suitable gadget. Castings may be available for the stand, and may save a little sawing and filing; but one can be bent up easily enough from a piece of $\frac{1}{8}$-in. steel, measuring approximately $3\frac{3}{4}$ in. by 2 in. An odd bit of frame steel will do fine. Scribe a line down the middle, then set your dividers to $1\frac{7}{8}$ in. between points, and strike off an arc across one end, with one divider point on the centre line; then mark the piece of steel to the outline shown, and saw and file to shape. Beginners note, don't cut any notches in the curved edge yet; leave it plain. Mark off two lines at 1 in. and $1\frac{1}{2}$ in. from the bottom edge, and bend the stand to two right-angles, as shown in the cross-section and end-view; the offset should be exactly $\frac{1}{2}$ in., but you needn't bother about "mike measurements," as the lever has only to be set out sufficiently to clear the boiler.



Reverse lever for "Juliet"



Trigger



Latch

The retaining-plate, or sector-plate, is a curved strip of steel $\frac{3}{16}$ in. wide, same radius as the top of the stand. It may be bent up from a piece of $\frac{3}{16}$-in. by $\frac{1}{16}$-in. strip steel, if you are any good at what my young niece in her schoolgirl days called "bendification"; or it may be marked out, and sawn and filed, from a piece of 16-gauge sheet steel. Incidentally, several old readers of these notes want to know what happened to the before-mentioned niece; well, she just followed the usual feminine "profession"—got married just before the war, and now has two fine "O gaugers," the elder of the two finding his greates happiness beside the local railway line. I haven't seen him yet, as they live far beyond visiting distance; but he knows all about my railway and locomotives, and I guess we are both looking forward to a meeting in the not-too-distant future!

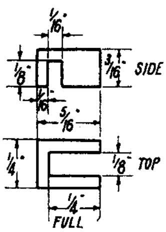
The sector-plate and stand are kept at the right distance apart, by two spacers, made by chucking a piece of $\frac{3}{16}$-in. round steel rod in three-jaw, facing, centring, drilling down about $\frac{3}{8}$ in. with No. 51 drill, and parting off two slices a full $\frac{1}{8}$ in. in thickness. Drill a No. 51 hole at each end of the sector plate, then clamp it to the stand, and use for a jig to drill similar holes in the top of the stand. Put a spacer between sector-plate and stand at each end, and rivet the lot together by a couple of $\frac{1}{16}$-in. iron or brass rivets. Drill four holes with No. 30 drill in the bottom extension of the stand, at the points shown in the illustrations; drill a No. 40 hole on the centre line, $1\frac{7}{8}$ in. from the top, and tap it $\frac{1}{8}$ in. or 5-B.A. for the fulcrum pin of the lever, and job No. 1 is done.

Lever

The lever can be milled, or sawn, filed, and turned, from a piece of $\frac{1}{4}$-in. square steel rod; or you can build it up, the latter being by far the easier for a beginner. In the former case, you need a piece of rod $3\frac{1}{2}$ in. long. Chuck truly in four-jaw, and turn the handle (but not like an organ-grinder turns one!) to the shape shown,

or to your pet fancy. Then reduce the rest to $\frac{1}{8}$ in. in thickness by milling or filing $\frac{1}{16}$ in. off each side, and finally taper the lever as shown. To build up, saw off a piece of $\frac{1}{8}$-in. by $\frac{1}{4}$-in. mild-steel $2\frac{3}{8}$ in. long; file it taper, and round off the full-sized end. Turn up the handle from a piece of $\frac{3}{16}$-in. round mild-steel held in the three-jaw and either braze or silver-solder it to the top of the flat part of the lever. I usually build up my levers, using a spot of Sifbronze to stick the bits together; with "white" Sifbronze, the joint is practically invisible. Right at the bottom of the lever, drill a 5/32-in. hole; at $1\frac{1}{2}$ in. above it, drill a No. 40 hole and tap it $\frac{1}{8}$ in. or 5 B.A. for the reach rod pin.

The trigger is milled, or sawn and filed, from a piece of $\frac{3}{8}$-in. by $\frac{1}{4}$-in. mild-steel a full $\frac{5}{8}$ in. long. Mark off the outline as shown, on one of the wide sides, then centre-pop and drill the two No. 53 holes clean through the block. For beginners' benefit I will repeat that when holes are required dead in line through a valve-gear fork, or anything with a similar gap between, such as this trigger, the best method of ensuring that they *will* be in line, is to drill a continuous hole clean through *before slotting*. If drilled after slotting, in 99 cases out of 100, the drill point will "wander" when it meets the other side of the gap, and the holes won't line up for toffee-apples. Next cut the $\frac{1}{8}$-in. slot right across the bottom of the block. If you have a regular $\frac{1}{8}$-in. milling cutter, mount it on a spindle between centres, clamp the block in a small machine-vice on the saddle, at a height sufficient for the cutter to take out the full depth at one "bite"; and using medium speed and plenty of cutting oil, you'll get a perfect slot. Another way is to clamp the piece on its side, under the lathe tool holder, at centre height, and traverse it across an end-mill or home-made slot drill (I prefer the latter, it cuts faster) held in the three-jaw. I have described several times, how to make these slot drills. The upper sides of the block are then milled, or sawn and filed away, to leave a tongue $\frac{1}{16}$ in. in thickness, which forms the trigger part. Note, after the lower ends have been rounded off, the slot should be open, top and bottom, right to the trigger.



Latch-block

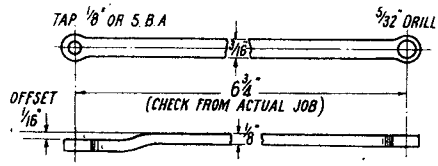
The latch is a tricky little doings, but can be cut from a piece of $\frac{1}{4}$-in. square steel about $\frac{5}{8}$ in. long, either by milling, or by saw, file, patience, and perseverance.

If a milling machine is available, mill away the two sides first, with a side and face cutter, then the surplus metal under the "bird's head," and finish off with a file, drilling the hole last of all. For hand work, follow the same "ritual," except that saw and file take the place of the milling cutter. The bird's head should fit nicely between the jaws of the trigger.

To make the latch block, a piece of $\frac{1}{4}$-in. by $\frac{3}{16}$-in. steel is needed, $\frac{5}{16}$ in. long. This merely requires cross-slotting, either by milling, as described above, or by judicious use of a thin flat file, such as used by key-cutters for forming the wards in keys. The $\frac{1}{8}$-in. slot should be a close fit on the lever; and the narrow slot should just be wide enough to let the cross-piece at the bottom of the latch, slip up and down easily.

How to Assemble

Put the trigger in the position shown, just underneath the handle of the lever, and put a No. 53 drill through the lever, using the hole in the trigger as guide. Remove trigger, and open out the hole in the lever with No. 51 drill; then replace trigger, and drive a bit of $\frac{1}{16}$-in. silver steel wire through the lot, filing flush each side. Put the bird's head of the latch in the slot at the other end of the trigger and pin it in similar manner; but instead of filing both sides flush, leave enough of the pin sticking out, to enable a weeny spring to be looped over the end. Now put the latch block in position, adjusting it so



Reach-rod

that when the trigger is squeezed against the handle of the lever, the cross-piece at the bottom of the latch is flush with the bottom of the block; but don't pin it to the lever yet.

Now we need a fulcrum pin for the lever. Chuck a piece of $\frac{3}{16}$-in. hexagon steel in the three-jaw; if you haven't any, use $\frac{1}{4}$-in. round. Turn down a full $\frac{3}{8}$-in. length to an easy fit in the hole in the bottom of the lever; then further reduce $\frac{1}{4}$-in. length to $\frac{1}{8}$-in. diameter, and screw $\frac{1}{8}$ in. or 5 B.A. to match the hole in the stand. Part off to leave a $\frac{1}{8}$-in. head; if round stuff has been used, slot it with a hacksaw. Put the lever in position between the sector plate and stand, screw the fulcrum-pin through the hole in the bottom, into the stand, and put a lock-nut on, outside the stand. When the fulcrum-pin is screwed right home, the lever should be just free to move, without any sideplay.

The latch block should just clear the curved top of stand and sector-plate; if it is too far away, make the necessary adjustment, and then drill a No. 53 hole clean through block and lever. Drive a $\frac{1}{16}$-in. pin through the lot, leaving enough projecting on the left side, to take the other end of the before-mentioned weeny spring.

To find the position of the notches, put the lever forward as far as it will go, mark the spot exactly under the latch, and file a little square-ended nick at that point, about $\frac{1}{16}$ in. deep, and just wide enough to take the latch without letting

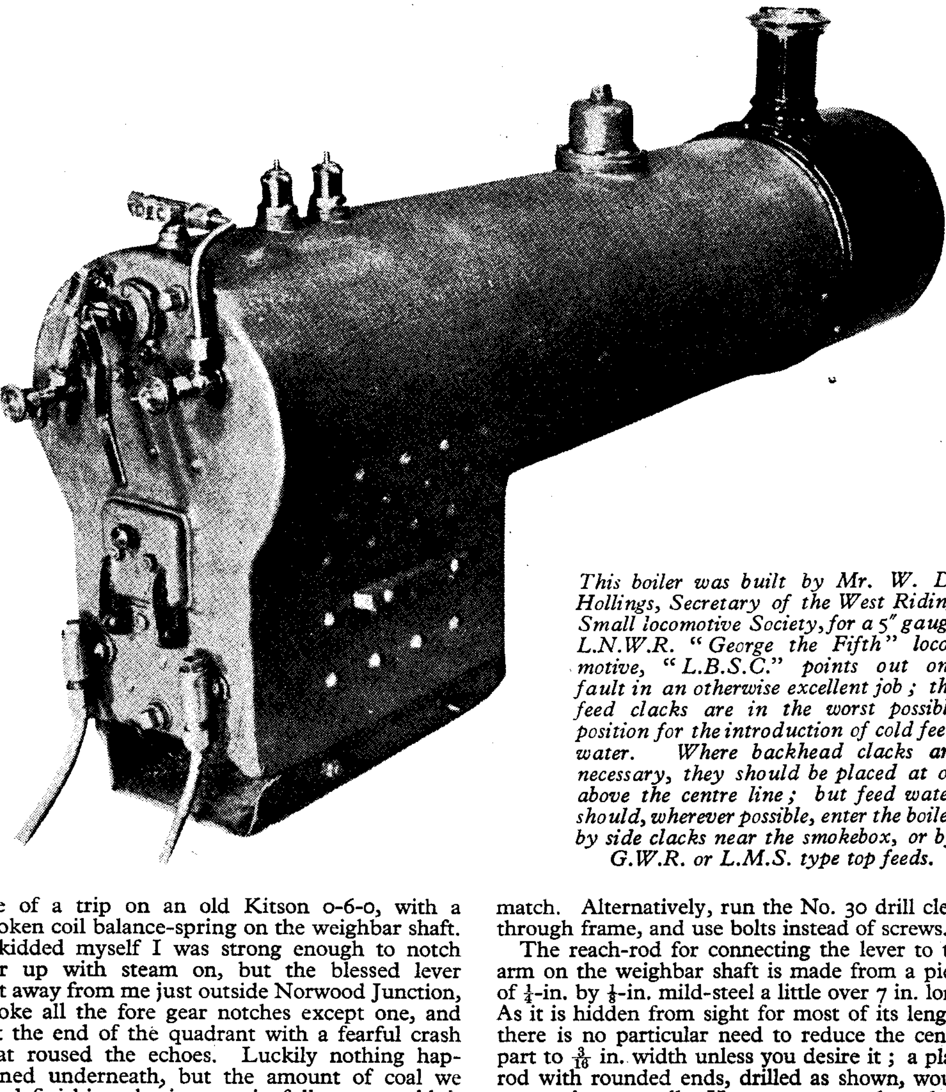
it rattle. Now pull the lever right back, and repeat operation; then put the lever in the middle, and file another notch. That gives you full forward and full back gear positions, and mid gear. The other notches are merely "rule-of-thumb"; just file them with a $\frac{1}{16}$-in. gap between, putting in four between mid and full gear each side of centre, and taking your measurements from full gear position. More notches and finer adjustment can, of course, be obtained by using a thinner latch, narrower notches, and less space between them, but I don't recommend it. Writing about these levers always reminds me of a trip on an old Kitson 0-6-0, with a broken coil balance-spring on the weighbar shaft. I kidded myself I was strong enough to notch her up with steam on, but the blessed lever got away from me just outside Norwood Junction, broke all the fore gear notches except one, and hit the end of the quadrant with a fearful crash that roused the echoes. Luckily nothing happened underneath, but the amount of coal we used finishing the journey in full gear wouldn't have pleased Mr. Shinwell a little bit!

All the goods drivers used to carry a wooden wedge to stick in between the latch and notches, to stop the lever from rattling, otherwise the din was absolutely awful when the engine began to get a move on. Happy days!

How to Erect the Lever

Set the lever assembly with the step in the stand level with the top of frames, as shown in the end view, and the centre line of the stand $1\frac{1}{2}$ in. from the back of frame (see side view). Clamp temporarily in place, using toolmaker's cramp or any other means available; run the No. 30 drill in the holes at the bottom of stand, making countersinks on frame; follow up with No. 40, tap $\frac{1}{8}$-in. or 5-B.A., and put in screws to match. Alternatively, run the No. 30 drill clean through frame, and use bolts instead of screws.

The reach-rod for connecting the lever to the arm on the weighbar shaft is made from a piece of $\frac{1}{4}$-in. by $\frac{1}{8}$-in. mild-steel a little over 7 in. long. As it is hidden from sight for most of its length, there is no particular need to reduce the centre part to $\frac{3}{16}$ in. width unless you desire it; a plain rod with rounded ends, drilled as shown, would answer just as well. However, one end needs to be offset, as indicated in the detail sketch, to make a proper connection between reach-rod and reverse-arm. The cab end of the reach-rod is attached to the lever by a similar pin to the



This boiler was built by Mr. W. D. Hollings, Secretary of the West Riding Small locomotive Society, for a 5" gauge L.N.W.R. "George the Fifth" locomotive, "L.B.S.C." points out one fault in an otherwise excellent job; the feed clacks are in the worst possible position for the introduction of cold feed water. Where backhead clacks are necessary, they should be placed at or above the centre line; but feed water should, wherever possible, enter the boiler by side clacks near the smokebox, or by G.W.R. or L.M.S. type top feeds.

fulcrum-pin, except that the screwed part is only $\frac{1}{8}$ in. long, threaded to match the hole in the lever. When screwed right home, the eye of the reach-rod should have just the weeniest bit of side-play, not enough to rattle. The other end of the rod is attached to the reverse arm by a $\frac{1}{8}$-in. or 5-B.A. screw having a full $\frac{1}{8}$ in. of plain part under the head, so that when it is screwed through the hole in the reverse arm, into the reach rod, the joint should be perfectly free when the screw is in tightly. "Juliet" will be able to turn her little wheels pretty quickly, and shake the valve-gear up to some purpose, so all builders should make absolutely certain that there are no screws, or bolts, or anything else in the valve-gear, left slack enough to stand the slightest chance of working loose. Final tip for beginners: don't take the given measurement for the reach-rod, between centres of holes, as "absolute gospel" in case of any error in setting out and erecting either weigh bar shaft, arms, or lever. Put the lever in mid position, and the valve-gear ditto; that is, with the die-blocks in the middle of the links. Then measure the distance between the centre of the hole in the reverse arm, and the centre of the tapped hole for the reach-rod pin, in the lever; that will be the exact length of the reach-rod between centres, *after* setting same over as shown.

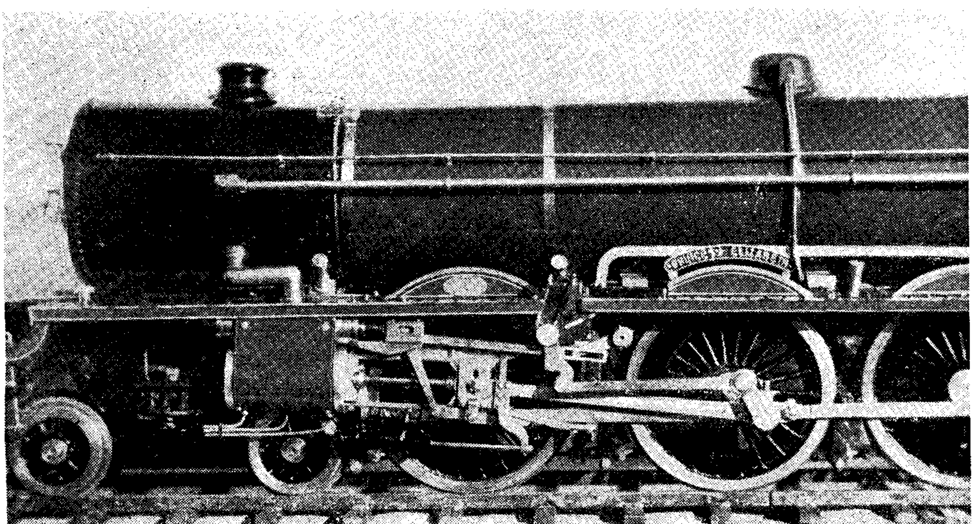
All that remains, it to connect the projecting pins in the trigger and latch block, by a similar spring to those on the mechanical lubricator pawls. When the lever is in the full forward and backward notches, the corresponding eccentric rods should be opposite the die blocks in the links, and the valves will cut steam off at about $\frac{3}{4}$-in. stroke. Beginners should remember that because an engine has a valve-gear that enables an early cut-off to be used, it doesn't follow that an early cut-off should be used *all the time*. Also, if you try to start an automobile engine by hand, with the ignition fully advanced, you stand a chance of getting a sprained wrist, if nothing worse; and starting a link-motion locomotive with the lever next to middle, is a steam equivalent. My recommended valve settings give the correct amount of lead (corresponding to correct ignition point) for a quick smooth start in full gear, and just as you advance the car engine's ignition as the speed increases, notching up a link motion opens the ports earlier as the wheels turn faster, and thus maintains full pressure on the piston heads as the cranks pass the dead centres, with the added advantage of closing the steam ports early, economising steam, and opening the exhaust ports early, avoiding back pressure.

How a "Chatterbox" Was Cured

Some little time ago, I gave an account of how a new tail bearing was fitted to the mandrel of my Milnes "Type R" lathe, and said the information might be interesting to other lathe users. It certainly was! The following extract from a correspondent's letter is worth putting on record; I cannot do better than quote the actual written words. My correspondent writes: "I wish to thank you sincerely for solving for me a problem which has been nattering at me for the last ten years. What a chump, you will say, for taking ten years over the solution! Well, perhaps so, but this was the way of it. Ten years ago I bought a new 5-in. lathe of well-known make, thinking that if I sprang the cash for a new lathe which had not been mucked about by some other twerp, I should be sitting pretty. But was I—heck! It would neither turn nor bore parallel, and parting-off was just too bluepencil.

"I temporarily rectified the lathe sufficiently to construct my first locomotive, afterwards stripping it right down, and rebuilding it very carefully, bedding down all sides to a surface-plate; also having the mandrel ground up dead true all over, and the spindle bearings lined with

(*Continued on next page*)



The "works" of Mr. Hollings's L.M.S. 4-6-2 "Princess Elizabeth"

BUOYANCY — *By R. F. Wilson*

MODEL marine work when completed looks and is beautiful, looks but is not difficult, looks but is not expensive; in fact, size for size, it is one of the cheapest forms of model engineering.

If a beginner should be contemplating building a working model, it is essential that he should understand that this is a branch of model engineering where, if the first and vital principle is wrong, no amount of juggling with weights will put a model dead right. This being so, it is as well to point out that the fundamental basis of a working model, as against an exhibition model, is buoyancy, and without going into the theory of this subject, it can best be demonstrated by saying that if you have two hollow hulls of the same material and of identical outside form, but with different thickness of hall walls, the one with the thinnest wall would have the highest buoyancy factor.

The reason why the buoyancy factor is so important is because it is this which governs the total weight the hull can carry and at what height from the bottom of the hull, without wallowing like a duck ashore, or turning right over.

It is known that a hollowed-out wooden hull, can be made quite quickly until the final stages of thinness are reached, when the greatest care, and, naturally, the longest time must be taken. The writer has found from his own models that it is quicker in the end not to hollow out the hull, but by using it as a former, form a light metal hull round it, so that when the wooden hull is removed there is left a metal hull of the highest buoyancy factor into which can be placed the power plant, and on which can be built the superstructure. Unless the superstructure has been made from solids, the model will need lead ballast placed along the bottom inside the hull to bring her down to her designed water-line, without need for that monstrosity, the false keel.

It is best to install the boiler so that its top is either below, or in line with the designed water-line, not above it; because, although we know that a large boiler means long runs between refills, it is rather absurd to have to reduce visual deck details just to carry a lot of extra water in a massive boiler carefully hidden below decks, when model is floating in that same water, which, with just a little exercise can be transferred from outside the hull into the inside of a boiler of a size the completed model can carry.

We also know that the strongest container for the petrol required for the blowlamp is a circular tube with end plates brazed on; but it has been found that with the pressure as used by the "Prototype" men, it is quite safe to use a flattened oval tank with cross stays to the end plates. This type of tank not only reduces the height of the weight of the petrol and container above the bottom of the ship, but also reduces the height of the weight of the valves, filler cap and outlet pipe as well.

This "height of the weight above the bottom" is important, because cases have been known where a beginner has completed a working model ship only to find that, although she floats along the designed water-line as long as his hand keeps her upright, she develops a decided list one way or the other as soon as his hand is removed. This puzzled the builder until it was pointed out that, although the total weight was correct, far too much of it was high up from the bottom, and the writer explained matters in this way: somewhere inside the hull there is a point which the weight above this point uses as a fulcrum to lever the weight below it upwards, and hence causes that list. When this is understood, it becomes obvious that the higher a weight is above that point, the less will be the weight required to produce the same degree of list, which is the reason why we try to get the greatest amount of weight inside the hull to lie along the bottom and as close to the centre line as possible.

"L.B.S.C." *(Continued from previous page)*

white metal and rebored a close fit for the mandrel. There were numerous other little improvements; but when everything was re-assembled, I found that the parting-off was no better than before, so I just used to set my teeth, whilst the spanners bounced about on the lathe bed and usually finished up on the floor! Then Hitler started his games, so the problem was shelved for several years, during which period I acquired a 1 in. to 2 in. mike, in addition to my 0 in. to 1 in. ditto.

"A few months ago I read your account of the new outer bearing you fitted, after 23½ years, to your Milnes lathe when chatter began to appear in turning. I jumped out of my armchair with a yell of 'Curly has hit it,' to the great alarm of my good lady, and rushed out through a snowstorm to my garden workshop, where in about half-an-hour I dismantled my headstock for about the umpteenth time, pulled the outer bush out of the casting (with a pair of pliers—'nuff sed!) and got to work with my 2-in. mike. In a few minutes the trouble was laid bare. There was not only 0.001 in. play between the bush end and the mandrel, but the bush was 0.002 in. slack in the headstock casting.

"I acquired a nice length of phosphor-bronze, and took it, plus the old parts, around to an obliging friend who kindly promised to do the needful. He has just become the proud owner of a practically new 4½-in. South Bend lathe, which is a lovely machine, and made short work of the new bush. I drew it in carefully with a long bolt and a couple of plates, re-assembled the rest of the head-stock parts, tried my broadest parting tool on a bit of mild-steel, and it went through like a knife slicing butter. The problem was solved at last, and thank you, Curly, you old trouble-shooter!"

Comment is needless; as my correspondent himself remarked, "'nuff sed!"

SALVAGING A DISCARDED MOTOR

By M.A.C.

SOME months ago, in return for a small lathe job I had done for a friend, I was presented with a motor of about one-eighth horse power, which had originally been installed in a washing machine. It was in rather an poor state of repair, but, having ascertained that the windings were intact, it was decided to put it into serviceable condition for use in my small workshop.

New terminals, terminal nuts, brushes, brush-holders and springs were made. The commutator was skimmed up between centres, and after thoroughly cleaning the bearings and wick-feed lubricators, the motor was wired up and functioned perfectly.

I had already planned, should the motor prove repairable, to use it as a drive for a small drilling machine I had made, and it therefore became necessary to find out its speed. Using a revolution counter, this was found to be 8,500 r.p.m. and far too high, unless a substantial reduction could be obtained, for the intended purpose. Some sort of high-reduction gearing was clearly indicated, so a worm-gear of 20 to 1 ratio, giving an ultimate speed of 425 r.p.m., was schemed.

The principal features of this consist of a worm having a double-start thread of 0.200 in. lead (the maximum my lathe will cut), and a bronze worm-wheel of 40 teeth. As all the work was done on a 3-in. treadle lathe, the method may be of interest to readers.

The worm (*a*), Fig. 1, was gripped in the chuck, and whilst supported by the back centre, was finished at one setting. The threads, which are of " Acme " form, were first roughed out with a vee-shaped tool to full depth, and finished with a tool of correct form, the indexing between the double thread being obtained by slipping the change-wheels. Before parting off, the hole to fit the end of the motor spindle was drilled and reamed, after which a hole was drilled and tapped to take a 4-B.A. Allen grub-screw for securing purposes.

The turning of the worm-wheel calls for little comment. Having worked out the correct pitch diameter, this was straightforward machining, but before parting off a circle was scratched on one face near the edge of the wheel, the object of which will be mentioned later.

After finding the helix-angle of the worm (i.e. $\frac{\text{lead of worm}}{\text{pitch circumference}}$ = tangent of helix-angle), a set-up shown in Fig. 2 was made for cutting the worm-wheel teeth. A piece of mild steel (*a*) was clamped at the correct angle to the faceplate, a hole drilled and tapped, and a seating machined for the arbor (*b*). This assembly was secured squarely to the lathe cross-slide to receive the worm-wheel, as shown in Fig. 3.

Possessing no dividing head or 40-tooth gear for indexing, the worm-wheel face was coated with spirit-blue (an ideal medium for marking off), and forty divisions were carefully marked off with draughtsman's dividers around the line previously scratched on the face of the blank, each intersection being very lightly centre-punched. With the blank mounted in position on the arbor, a pointed index finger was set to come exactly over the circle of dots.

No hob being available, the cutting of the teeth was done with a fly-cutter of " Acme " form, which was set to project to the correct radius from the cutter bar. Having found the centre of the blank in the lateral direction, the cross-slide was fed in until the whole depth of tooth had been reached. Withdrawing the cross-slide, the arbor nut was loosened, and the wheel indexed round so that the consecutive dots and the index-finger coincided, a jeweller's glass being used to ensure this. Working round in this way until the first space was again reached, I was surprised (and gratified) to find that, after feeding into the full depth, there was no sign of metal being removed. This was probably partly due to the tool having worn, but it provided a partial check on accuracy, and the job was pronounced passable.

The framework shown at (*c*), Fig. 1, was bent from ⅛-in. aluminium sheet, and afterwards filed up square. The holes for worm and worm-wheel spindles were marked off, and drilled and reamed from the headstock, the framework being clamped to the cross-slide during this operation. The two

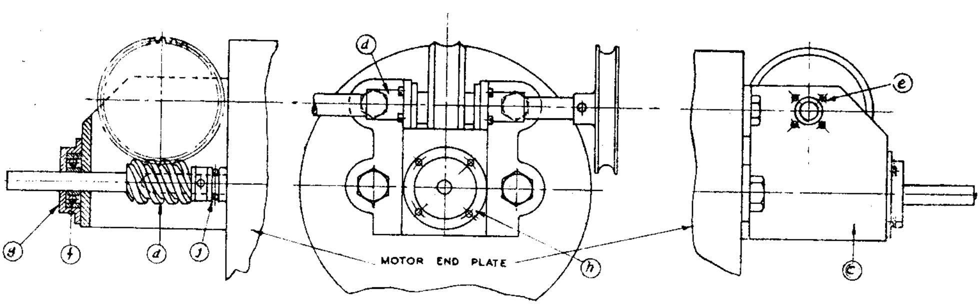


Fig. 1

bronze bushes (*d*) are secured to the frame by screws (*e*). The long end of the worm had been made to fit a small metric size ball-race (*f*) I happened to have on hand, and this was fitted into a dural housing (*g*) secured to the front of the frame by screws (*h*). A thrust-race (*j*), which consists of six 3/32-in. diameter balls, retained in a brass cage, and running between two hardened discs of silver-steel, is situated at the rear of the worm.

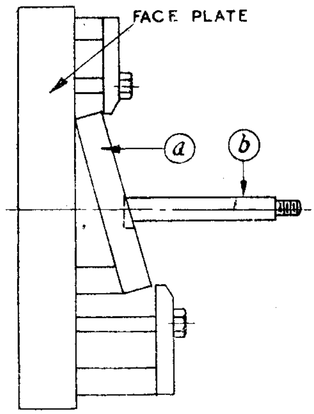


Fig. 2

The reduction gear, now complete, was secured to the motor end-plate through the four holes drilled in the framework, by two bolts passing through existing holes and two set-screws, for which further holes were drilled and tapped. To retain grease for lubrication, a thin plate is secured to the underside of the framework, and pulleys fitted to each end of the worm-wheel spindle drive, the small drilling machine already mentioned, and a 4-in. grinding wheel, in each case by means of $\frac{1}{4}$-in. diameter round belt.

It will be noticed that the worm spindle projects some distance from the front of the framework. This was arranged to enable a drive to be taken from this point to a small flexible shaft, which originally was part of a speedometer.

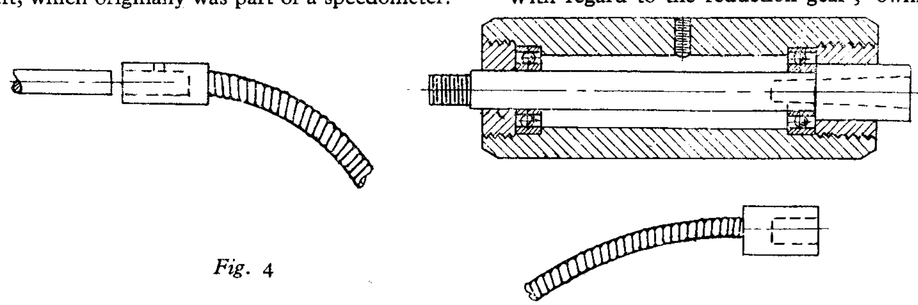


Fig. 4

The arrangement is shown in Fig. 4. One end of the shaft was sweated to a small coupling, which can be secured by grub-screw to the end of the worm spindle. The other end, fitted with a screwed coupling, attaches to the grinding, scurfing and polishing tool shown in the same figure. This consists of a length of hexagon dural bar, bored a clearance fit for the spindle, counter-bored at each end to a press-fit for the two ball-races, and also screwed for the two retaining plugs. The spindle, which was made from silver-steel, was bored and reamed No. 1 Morse taper to fit the shank of a small drill chuck. A tapped hole, furnished with a grub-screw, admits oil for lubrication. In use, small drills, rotary files, grinding wheels, and emery bobs are gripped in the chuck and much useful free-hand work can

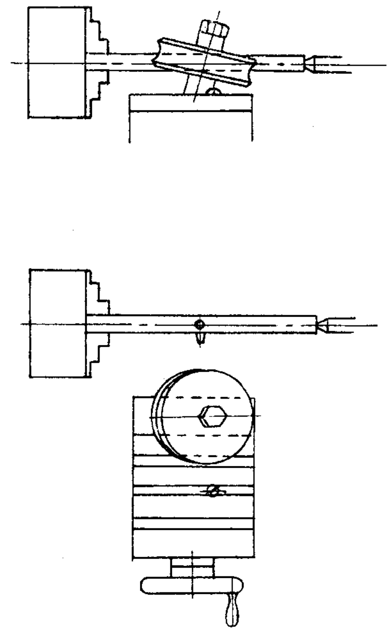


Fig. 3

be achieved. Unfortunately, the only speedometer cables I could find were all wound right-handed and would not provide a positive drive, but so long as no heavy work is attempted, and the tools are kept to a reasonably small diameter, it seems to work quite well.

With regard to the reduction gear ; owing to the excessive rubbing speed of the worm, and the rough-and-ready method used to produce it and the worm-wheel, no claim can be made to have produced an efficient gear ; but it serves my purpose quite well, and being used only a few hours in the course of a week, should fulfil all needs until the "ideal" workshop, and some better equipment, comes my way.

PETROL ENGINE TOPICS

★ A 15-c.c. FOUR-CYLINDER ENGINE

By Edgar T. Westbury

The timing endplate, Fig. 9, can be machined to suit either hand, according to which end of the engine it is fitted. Thus the boss on one side is superfluous, and must eventually be machined away, but in the meantime, it serves a useful purpose as a chucking piece for boring the ball-race housing, turning the spigot and facing the inner surface which seats against the machined face of the main block. The fitting of the spigot and the ball-race is much the same as for the main housing, but the bore is in this case taken right through, so that the ball-race has no positive end location either way. After completing these operations, the casting is reversed, and held by the spigot in the three-jaw chuck for facing the other side, and removing the unwanted boss. It is essential that the inner and outer faces should be parallel, and this may be verified by measuring the thickness with a micrometer at various points. Further machining on this part should be deferred for the present, until other parts are ready for fitting.

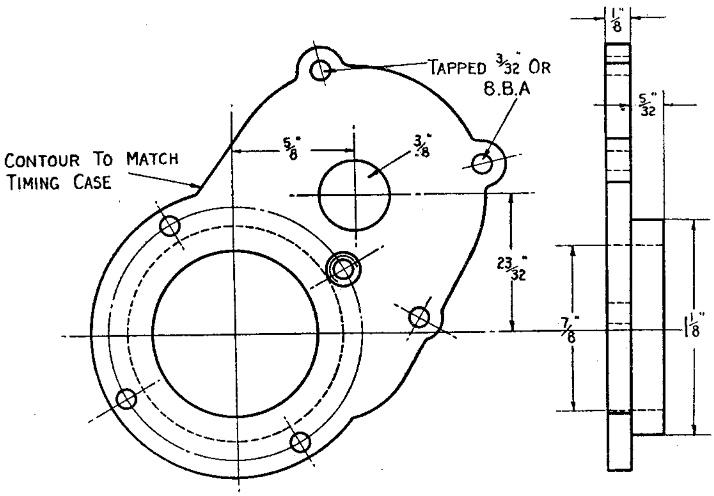


Fig. 9. *Timing endplate*

Timing Cover (Fig. 10)

In order to enable the timing cover to be fitted at either end of the engine, two separate castings, right- or left-handed respectively, are available, but whichever of these is used, the machining operations are essentially the same. The first operation is the facing of the inside joint face, which may be carried out by holding it in the four-jaw chuck. Then reverse the casting and clamp it to the faceplate, with the main shaft boss set to run truly; face and centre the boss, and bore it to $\frac{7}{16}$ in. diameter.

A simple aligning plug is now made, one end of which is turned to $\frac{7}{8}$ in. diameter, to fit tightly in the bore of the timing endplate, and the other to $\frac{7}{16}$ in. diameter, to fit the bore of the cover. This registers the two parts exactly in position for drilling the screw holes

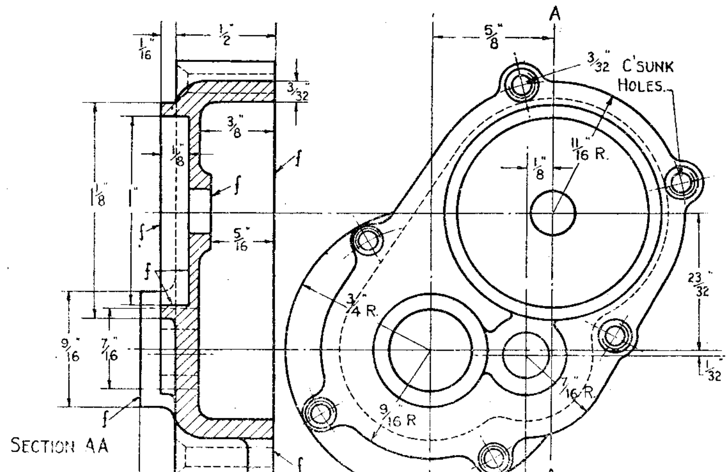


Fig. 10. *Timing cover*

**Continued from page 344, " M.E.," March 20, 1947.*

around the edge, to secure them together temporarily or to attach both to the main block for further operations. It may be considered desirable to dowell the parts together to ensure accuracy of register, in which case the dowel holes may be drilled from the back of the endplate, anywhere between the screwholes ; but with carefully fitted countersunk screws, this precaution should not be necessary. The three upper screwholes in the endplate are tapped so that the parts can be held together without the screws projecting at the back ; the rest of the holes are drilled clearance size, and after fitting the endplate in position on the main block, these holes are used to locate the tapping holes in the block, which follow through from the three lower holes in the timing case. A fourth hole is drilled in the timing endplate, to take a countersunk screw, so that there are four equidistant screws securing the endplate to the block ; *this hole does not come through the timing case.*

It is now necessary to continue the bore of the camshaft housing through the timing endplate and cover, in exact alignment. There are various ways of doing this, and in a large lathe it may be practicable to use a spigot mandrel in the chuck, with the entire assembly mounted on it, so that the centring and boring of both castings could be done *in situ*. Failing this, a piloted drill may be made by turning a bar to a close running fit in the camshaft housing, with a hole drilled in the end to take either a centre drill or a short stub drill, which may be secured by a grub screw or soft solder. This is used by running it in the lathe or drilling machine, to start the hole from the inside of the endplate, after which it may be opened out with a larger drill, and finally reamered. The procedure is repeated on the inside face of the timing cover.

It should be noted that the machining of the seating in the timing cover may need to be varied to suit alternative fittings or arrangement of the ignition distributor, but, for the present, no harm will be done if it is machined as shown on the detail drawing.

Crankshaft (Fig. 11)

The material specified for the crankshaft is medium alloy steel, about 35 to 50 tons tensile strength, but in view of present supply difficulties, constructors who are unable to obtain this may have to use mild steel, which will be satisfactory as to mechanical strength, but somewhat inferior in respect of wearing properties. It is hardly practicable to case-harden the crankpin journal surfaces because of liability to distortion. The steel should be normalised before machining, by heating to an even dull red and allowing to cool naturally ; this will release any internal stresses produced in the rolling process, particularly in cold rolling as applied in the manufacture of bright mild steel.

The outside dimensions of the crankshaft are $6\frac{1}{2}$ in. by $1\frac{1}{8}$ in. by $\frac{7}{16}$ in., but it is desirable to allow a little on both the length and breadth for finishing ; the thickness is not quite so important, though it may be found convenient to use a bar $\frac{1}{2}$ in. thick, and machine the sides after other operations are completed. Round bar may be used if desired, the only objection to it being the

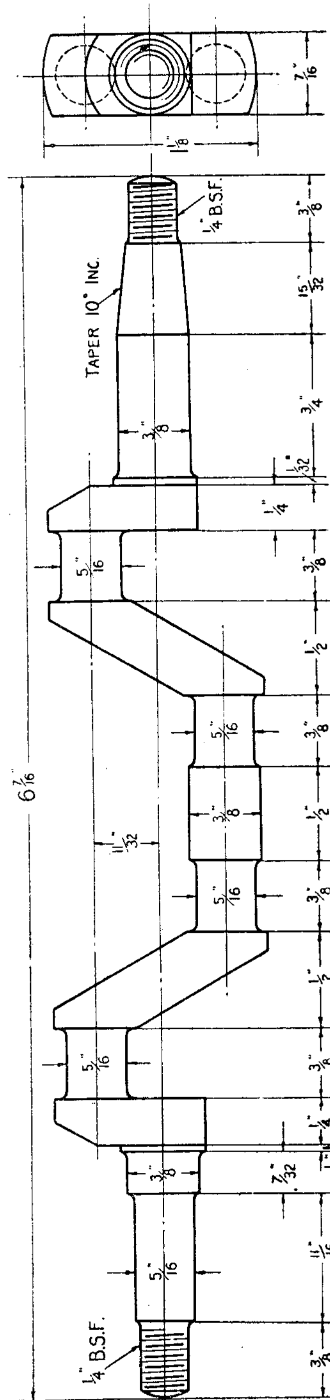


Fig. 11. Crankshaft

amount of material to be removed, and the difficulty of doing this by any other method than eccentric turning, which may be a slow and laborious process on a small lathe. The crank webs may be left circular if round bar is used, but there is no mechanical virtue in this shape, and it serves only to add weight to the crankshaft too close to the centre to have any substantial flywheel effect.

Marking out of the main and crankpin centres is carried out in the usual way, by supporting or clamping the bar parallel to the surface of a flat plate, and using a scribing block to mark a centre line on both ends. If the bar should be distorted so that it does not lie evenly on its supports, it should be packed to eliminate all suspicion of "rock," so as to ensure that the lines marked on the two ends are in exactly the same plane. Next turn the bar up on its edge, that is, at right-angles to its first position; it may be found desirable to clamp it lightly to the side of an angle plate, with parallel packing blocks underneath. Set the scriber point to the centre height of the bar and mark cross lines on each end, to indicate the position of the main centres. The scriber may now be re-set by measurement to mark the crankpin centres in a similar way, at a distance of 11/32 in. above and below the main centres respectively.

As there is some risk of error in measuring these distances, however, a positive check on their accuracy, or at least their equality (which is the most important thing) may be carried out as follows: Centre-punch the intersection of the main centres at each end as accurately as possible, and make a small but positive indentation with a drill, either in a machine or a hand brace. Next deepen the centre each end by means of a centre-drill running in the lathe, the work being held by hand, with the indentation at the opposite end resting against the tail centre. The centre-drill should be of small size, with a pilot not more than $\frac{1}{16}$ in. diameter, for producing a properly proportioned centre in a shaft of this size. Now run the work between the main centres, and, by means of a point tool presented in turn to each end face, make a light scratch to coincide as closely as possible with the marked radial position of the crankpin centres. Remove the work, and check the distance between these centres with dividers, aided, if necessary, with a lens; it is fairly obvious that it is possible to work twice as accurately by measuring *diameter* as compared to *radius*. Should the distance be found correct, the scratches may be deepened with the point tool, so that risk of error in working to the marks, with centre-punch and drill, are reduced. But a slight error in the crankpin throw is of minor importance, providing that all crankpins have the same throw. Drill the crankpin centres in the same way as the main centres.

Should it be desired to modify the crankpin throw in order to alter the engine capacity, this can be done to a limited extent—it is possible to go up to $\frac{3}{4}$ in. stroke or down to $\frac{5}{8}$ in. stroke—but it should be noted that this affects the length of the connecting-rod, which must be shortened if the stroke is increased, or *vice versa*, to the same extent as the difference in crankpin radius, in order to bring the piston to the same position in the cylinder at T.D.C.

A good deal of the superfluous metal on the crankshaft may now be removed by drilling and sawing, but do not forget that the ends of the bar must be left intact to preserve the throw centres until the machining of the crankpins is completed. The oblique centre webs of the crankshaft help to simplify crankpin turning, as they give plenty of tool room and eliminate the need for special long-reach narrow tools, such as are often found necessary for work of this nature. As the shaft is of comparatively robust section, it should be found possible to dispense with "stretchers" or other steadying devices, if due care is exercised and keen, narrow-pointed tools are used; but should it be found desirable to do so, the gaps may be stiffened by clamping straps across them, to bear firmly on the sides of the bar. The sloping webs may be machined by turning from the crankpin centres, producing a convex surface, or square across from the side faces by milling, shaping or filing, as desired; the former method, in my opinion, produces the most shapely result, and the most efficient disposition of material. Finish the crankpins as accurately and smoothly as possible, so that very little finishing by the use of abrasive methods is required.

Having completed the crankpins at both throw settings, the ends of the shaft may now be turned on the main centres. The most important point in this operation is to get the diameter of the ball race seatings correct. It should not be necessary to use undue force in fitting these races, but on the other hand, slackness must at all costs be avoided. The use of a very fine smooth file is permissible for fitting these races, and on the flywheel end, the journal may be very slightly tapered, so that it is not necessary to press the race on all the way. Finishing of the taper may be deferred until the flywheel has been bored, as it is easier to fit the mating tapers by working on the outside surface than the inside. Screwcutting of the threads at each end of the shaft should be done by generating methods if possible; the use of dies, except possibly for finishing purposes, is liable to result in "drunken" threads, which tend to throw mounted components out of truth and impose distorting strains on the crankshaft.

Why a Two-bearing Crankshaft?

Some queries and criticisms have been received on this point, many readers considering the two-bearing shaft "cheap and nasty," and expressing preference for at least one additional bearing in the centre; some would go even further, and put a bearing between each throw, making five main bearings in all. There are, however, excellent reasons why I have adopted the simplest possible bearing arrangement, the first and most important of all being the purely practical one of avoiding difficulty in the lining-up of the bearings. The process of line-boring bearing seatings in a crankcase as small as that on this engine is by no means an easy one, and although there are possible expedients to reduce difficulties in this respect, it is questionable whether they are worth the trouble involved. Any error in bearing alignment would, of course, result in binding, or at least abnormal friction, so that the extra bearings would be worse than useless.

Secondly, the fitting of intermediate bearings

would inevitably increase the length of the engine, thereby adding to its bulk and weight, and reducing structural rigidity. Many motor car engine designers have found that an increase in the length of an engine exaggerates many structural problems, increasing the tendency to rocking couples and vibration, and unless the crankshaft is stiffened, it is liable to torsional vibration. Short bearings are prone to rapid wear, as oil films are squashed out at the ends, and in my opinion, bearings in small engines should never be less in length than their diameter. Many well-known motor cars have been fitted with two-bearing crankshafts, and instances have occurred where

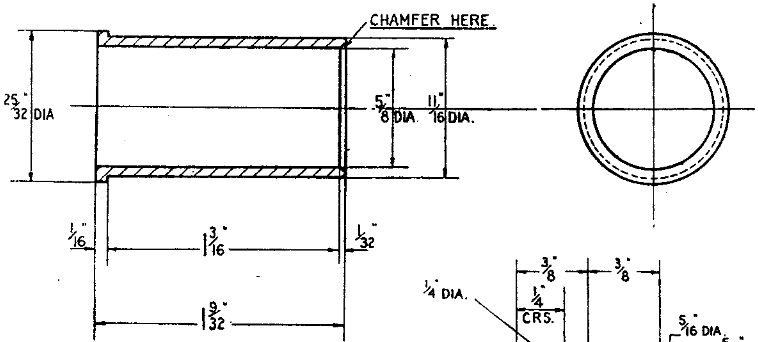


Fig. 12. *Cylinder liner* (4 *off*)

the addition of a centre bearing has not proved advantageous in the light of practical experience. The way to efficiency does not lie in the fitting of a multiplicity of bearings, but in arranging each bearing to carry its fair share of the load, and in preventing shaft deflection as much as possible. In this respect, the use of ball-races on the main journals, supporting the shaft as close up as possible to the crankpins, has been decided upon, after careful consideration, as the most satisfactory solution of the problem.

Cylinder Liners (Fig. 12)

The use of centrifugal or chill cast iron has been specified for these, as being the best material to withstand wear in the normal (un-heat-treated) condition, but steel may be preferred by some constructors, and if judiciously selected for its wearing properties, will be quite satisfactory. I have found that a "straight" carbon steel such as "Pitho" wears well, and almost as good wearing properties may be produced by muffle-carburising mild steel, so as to increase the carbide content of its surface structure, without subsequent hardening by quenching.

The machining of the liners is quite straightforward, and if the boring of the seatings has been carried out as directed, they may all be made to exactly the same external and internal dimensions. If the length of the material available allows an ample amount for chucking, they may be turned inside and out at one setting, but failing this, they should first be bored to within about 0.001 in. of finished size, then mounted on a mandrel for turning the outside. The locating rim at the top of the liner does not need to be an exact fit in the recess of the block, but care should be taken to see that it will go in, and a slight allowance should be given on the length of the rim for finishing flush with the top surface of the block after insertion.

On no account should the liners be fitted too tightly to their seatings in the block; shrink fits or heavy press fits are quite unnecessary, all that is required being to ensure that the liner has a close contact with the seatings at top and bottom and is not liable to turn or otherwise shift after insertion. About 0.0005 in. is the correct amount of interference if one has the means of internal and external measurement to a fine enough limit of accuracy.

The main lapping of the liners may be carried out before insertion, the lap being run in the lathe, and the liner held in the hand with a strip of rag

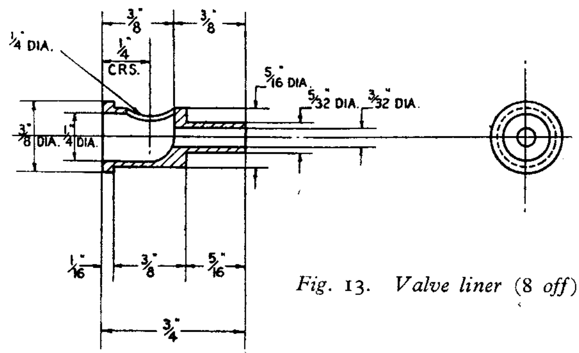


Fig. 13. *Valve liner* (8 *off*)

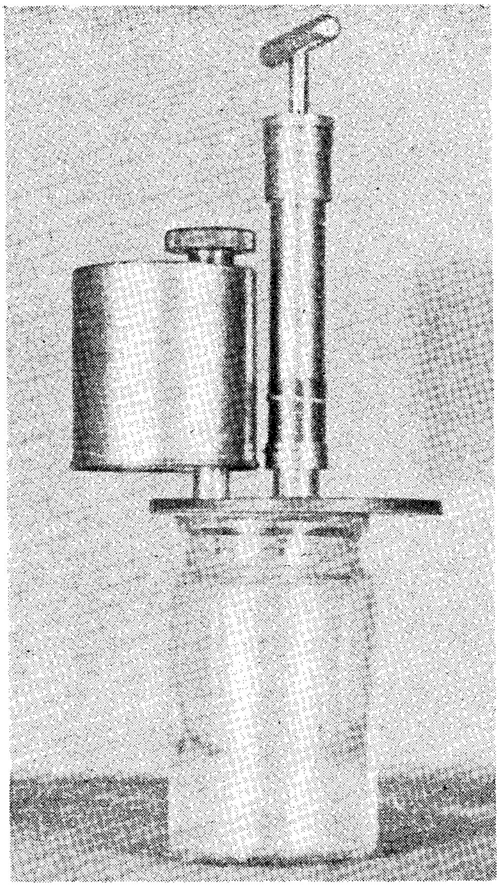
wound round it to increase the grip. In this way good control and "feel" of the lap is obtained, and no distorting force is applied to the liner, such, as might happen if it were held in a chuck. If the liners are inserted before lapping, it is very difficult to get a sensitive "feel" on the block for proper control of lapping, and it is advisable only to carry out a light finishing lapping operation after they are inserted.

It should be possible to press in the liners by means of the lathe tailstock, using a drill pad in the socket of the barrel, and resting the casting against the faceplate. This will ensure a much better alignment of thrust than is possible by using the vice or an improvised press for the purpose. The outside of each liner should be given a light coating of copal varnish, or even paint, before insertion, as this will serve the dual purpose of a lubricant during insertion, and a sealing medium to prevent creepage of either water or gas later on.

It should be noted that the cylinder block may be bored to take liners up to 11/16 in. bore and 3/4 in. outside diameter, which, in conjunction with slightly increased crank throw, will enable the

(*Continued on next page*)

A VACUUM PUMP



IN the photograph is shown a vacuum pump to be used n the impregnation of coils. To the left of the pump is seen a vessel to contain the impregnating medium, and a stop valve to control the supply. Both the pump and container are mounted on a fibre disc which has, interposed between it and an ordinary jam-jar, a rubber washer. The disc is retained firmly on the jar by atmospheric pressure when the pump is used.

After making this apparatus, I filled a small test tube with mercury and inverted it in a small glass container, also containing mercury. This primitive barometer was placed in the jam-jar, and I set to work with the pump. I found that it was possible, with much labour, to reduce the pressure to 2 or 3 millimetres. It is, of course, reducing the pressure below about 2 centimetres which causes the greatest expenditure of work. Some hundreds of strokes of the pump are needed to reduce the pressure in a 1-lb. jam-jar to 3 mm. by means of my pump ($\frac{3}{8}$ in. diameter × 3 in. stroke). The final vacuum depends on the clearance volume needed for inlet valve and the weight of valve, in this case a thin plastic $\frac{1}{4}$-in. disc covering a $\frac{1}{16}$-in. hole. The outlet valve is a band of thin plastic material round the bottom of the pump exterior. This valve covers two $\frac{1}{16}$-in. holes leading to the extreme bottom of the pump stroke. The piston, $\frac{3}{8}$ in. diameter, has a groove packed with graphited yarn. Making the stroke longer and increasing the pump diameter would reduce the ratio of clearance volume to the pump volume, so enabling a better vacuum to be obtained. Unfortunately, increasing the diameter of the pump increases immensely the effort needed to lift the pump handle. Perhaps the stroke of my pump could be increased with advantage.

Now I must make a confession. I have never used this apparatus for its original purpose. Bothersome doubts have afflicted me ever since making it. My chief doubt is: will the atmospheric pressure on top of the impregnating fluid be sufficient to force the fluid to every part of a fine wire coil, or will voids be left? I can think of no method of getting an *accurate* answer to this question.

I know that it is customary to apply pressure in excess of atmospheric pressure to impregnating fluids in commercial practice; so the problem is a real one.

I am sorry to leave this question unanswered, but perhaps some reader can supply the answer to it.—P. GRANGER.

Petrol Engine Topics

(*Continued from previous page*)

engine capacity to be enlarged to 20 c.c., should this be thought desirable.

Either cast-iron or bronze may be used for the valve liners, the former being best for wear resistance, but the latter less liable to loosen through differential expansion. They may be fitted rather tighter than the cylinder liners, as distortion of the bore is less liable to occur and has less serious consequences. The bores of the port end and the guide must be kept perfectly concentric and it will be seen that the end of the port bore is spherical, a special cutter or D-bit being advisable for finishing this. Do not drill the side port or chamfer the valve seating until after the liner is inserted, which may be done in the method recommended for the cylinder liners.

The block may now be mounted on the faceplate and a fine finishing cut taken over the top surface, including the rims of the liners, to provide a dead flush joint face, which is finally lapped until its flatness, as tested on a true surface plate is above suspicion.

(*To be continued*)

The late Henry Greenly

As previously announced in our pages, the death, on March 4th, 1947, of Mr. Henry Greenly, took place at his home at 66, Heston Road, Heston, Middlesex, after a long illness. He was seventy. As consulting engineer, editor and author of many books on model engineering, his work in this field is known and appreciated throughout the world.

Starting his career in the Engineers' Department of the Metropolitan Railway, his interest in railway models led, at the turn of the century, to his entering for THE MODEL ENGINEER competitions for the planning and designing of model railway systems. His success in winning several of these awards began his life-long friendship with Mr. Percival Marshall, then editor of that journal.

In 1901 Mr. Greenly was appointed assistant editor of THE MODEL ENGINEER and for the space of a few years his energy and drive contributed in placing this journal in a premier position in model engineering journalism. He resigned from this publication in 1906 to become a consulting engineer, specialising in model subjects. During this period he worked in close collaboration with Mr. W. J. Bassett-Lowke, of Bassett-Lowke Limited, in the preparation of locomotive designs for miniature railways in this country and abroad.

In 1908, feeling that existing journals were placing too little emphasis on the railway aspect of model engineering, he inaugurated a monthly magazine entitled "Models, Railways, and Locomotives," of which he was editor until it ceased publication in 1916, under the pressure of the war emergency.

At the outbreak of the first Great War, Mr. Greenly attempted to enlist in the Royal Engineers, but was rejected on medical grounds. He, therefore, took up an appointment in the drawing office of the Royal Aircraft factory at Farnborough, Hants., which was then engaged upon the design and production of the earliest military aircraft, which saw service during 1914-1918. Towards the end of his service with the Royal Aircraft factory, he specialised in aircraft armament design and was well known in Farnborough circles as "Gun Mount Greenly." He was responsible for the invention of the flash eliminator which was introduced on aircraft machine guns at the latter end of the Great War, and considerably improved the accuracy of night firing by eliminating the flash which dazzled the gunner and obscured the target. The need for a young generation of trained engineers and technicians in the aircraft industry was at that time being felt, as indeed it is at present. Mr. Greenly was co-instigator of the "Trade Lads School" at Farnborough, through which many hundreds of apprentices to the industry were trained.

With the conclusion of the Great War, Mr. Greenly's interest returned to railway and model engineering, but not before his far-sighted vision of the future trend of aircraft had shown itself in his invention of a power assisted control mechanism. This device proved, however, to be premature and it was not until the present day that some form of servo-control has proved necessary on very large aircraft.

From 1919 to 1922, Mr. Greenly was associated with a number of companies engaged in the production of model locomotives and railways, to which he acted as consultant and designer. In 1922 he became engineer to the Ravenglass and Eskdale Light Railway, in Cumberland, and under his guidance this was converted to 15-in. gauge. In addition to its use as a passenger-carrying line, well known to model engineers and many holiday-makers, this line carried His Majesty's mail and was used throughout the year to transport granite and granite products from the quarry near the railhead to the main line at Ravenglass.

Mr. Greenly was responsible for the installation of the stone-crushing and screening plant and trans-shipment sidings and tipplers at the terminus. He also produced an entirely new design of locomotive laid out to handle heavy traffic over the steep gradients of the line. Model makers will recall the famous "River Esk," which was originally fitted with poppet-valves and Lenz valve-gear. During this period, Mr. Greenly found time to contribute to the engineering press and publish his famous books, "Model Steam Locomotives" and "Model Railways," which for the past twenty years have been standard works of reference and a monument to a lifetime spent in model engineering.

In the field of physical achievement, however, he will probably be best remembered for his outstanding work on the "Romney Hythe and Dymchurch Light Railway." He was engineer to this venture from its inception in 1926 until its completion in 1930, and by his initiative and drive was responsible for all the civil engineering of this line and for the design of its locomotive and rolling stock. The original Pacific and 2-8-0 locomotives were constructed by Messrs. Davey Paxman to his design, and are still in service. The railway was requisitioned by the military authorities during the last war and served a useful service in the defence of that part of the Kent coast.

(Continued on next page)

The Case for a Hobby

By "1121"

[*In a recent debate on the subject* "*Hobbies—are they a curse or a blessing?*" *the writer was asked to open the case for the defence, and it is thought that his remarks might be of interest to readers.*]

BEFORE expounding the theorem with which I have come armed tonight, I would like to compliment our very good friend, Mr. P. ———, whom we all know to be an ardent pro-hobbyist in at least one field, on tackling the difficult task of making the opening speech for the opposition, and on managing to rake out so many very reasonable arguments against the practice of indulging in a hobby.

My own task, of course, is easy. I have indulged in a great variety of hobbies at various times, ranging from conjuring to chicken-farming, inclusive, and all I have to do is to say why I do it.

Let me at this point endeavour to forestall any misguided folk who may, during the course of this discussion, attempt to defend hobbies by asserting that they can be useful, or profitable, or instructive. I have heard model aeroplane enthusiasts stoutly maintain that model aeroplanes are used in wind tunnels, for research, and so on. In my opinion, remarks like these, far from constituting a defence for a hobby, actually have just the opposite effect, being, in fact, only *excuses* for a hobby, and intimating that an excuse is necessary. A hobby doesn't need to be useful, or profitable, or constructive, to be worth while. Its main object is to provide enjoyment or relaxation for its follower, and if it does this it has justified its existence. In these days of restriction, and direction, and other obstacles in the way of sane living, there can be no possible doubt of the desirability of an activity which enables a person, for a few hours, to do *just what he likes.* I must admit that there is a strong argument in favour of a hobby which can be constructional, or educational, in preference to one which cannot, but it is only a secondary consideration, subordinate to its main virtue of constituting a relaxation and change of subject-matter on which to exercise the brain. There are many people who indulge in the collection of matchbox labels, or pinning butterflies on to boards, neither of which activities can be said to provide any gain in wealth or practical worldly education, but still I say "Good luck to them." I must admit that my own preference is for a hobby which is constructive rather than destructive. I much prefer to show my friends a model I have built and say "Look at this beautiful creation," rather than showing them a butterfly with a pin stuck through its middle and saying, "Look what I have *done to* this beautiful creation." Somebody may say that a *real* butterfly-collector will recoil in horror at the idea of mutilating the works of Nature by sticking pins through them, but I can quite easily counter this remark by asserting that a *real* model-maker would never have produced some of the monstrosities of which I have been guilty in the past. The point is, whether you are good, bad or indifferent, makes no difference. The value of the hobby can only be measured by the pleasure it gives you. No spectator can assess that value. You probably won't be able to yourself.

As soon as the main object of a hobby becomes the making of profit, or something which must be useful, or educational, it ceases to be a hobby and becomes an occupation. It may even become a profession, and then its follower has, maybe unconsciously, to look round for another hobby. If he doesn't, one may witness the common disaster of a man retiring from business through old age, frequently in spite of the fact that he feels he could perfectly easily carry on for another ten years, and finding he has absolutely nothing with which to occupy his mind. He then goes to pieces and dies off years before his time.

The man without a hobby is a dog without a tail. Anatomically the dogs tail is a useless appendage. Don't tell me it isn't useless, because it balances him when he is running away from his enemies in the jungle, or something like that. To the modern, domesticated, civilised dog, the tail serves no useful purpose. In fact, it is usually chopped off when he is a puppy. But who would deny him the right to wag what is left of it at us when he feels pleased? And who can avoid sharing the dog's exuberance when it is shown so plainly?

Finally, it is only through the practising of one of my hobbies that I am here tonight taking part in this discussion with so many good friends, which is sufficient justification in itself.

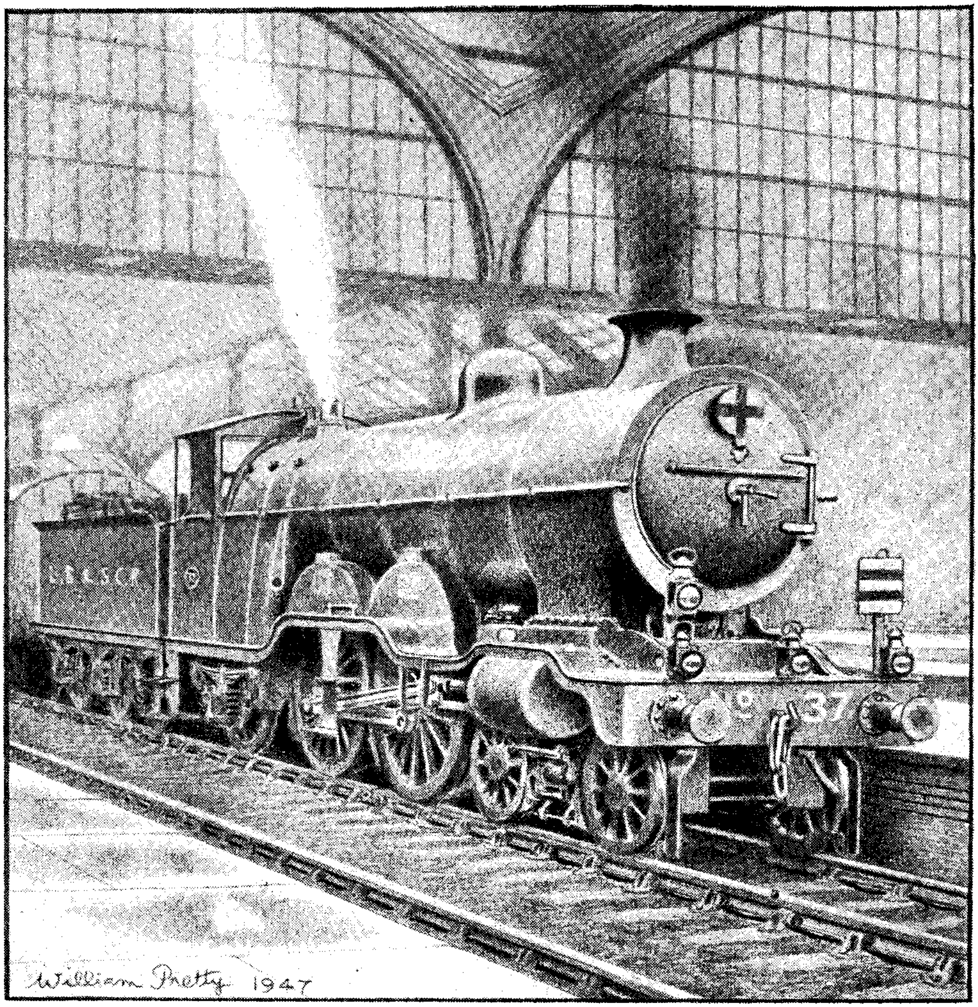
The late Henry Greenly

(*Continued from previous page*)

In 1930, Mr. Greenly reverted to his consulting work and continued to contribute to the leading model engineering journals. Just before the last war he invented a magnetic switch operated by the influence of an adjacent iron mass which has since found application in the operation of lifts and other moving vehicles.

His versatility and dynamic personality have left their mark in many of the realms of engineering. Though models were his main interest, he worked in fields as far apart as armaments and electrical engineering. His appreciation of the basic principles of mechanics, and his intuition for "rightness" of design have been preserved in his prodigious output of engineering drawings and articles, many of which are familiar to engineers. His memory will be preserved by his friends and colleagues throughout the world.

No. 37, L.B. & S.C.R.

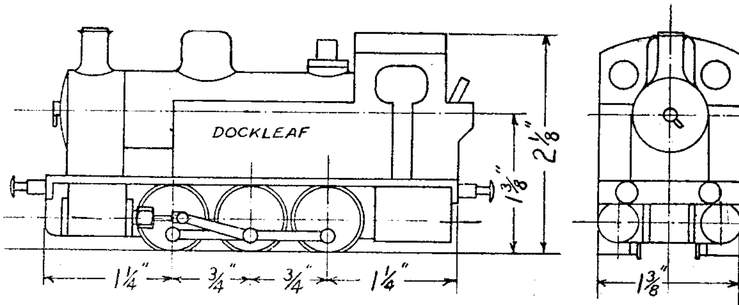


THE illustration herewith is from a pencil drawing by one of our readers, Mr. William Pretty, of Hendon. It depicts a scene that might have been observed at London Bridge station, London Brighton and South Coast Railway, from 1906 until about 1919. No. 37 was the first of Mr. Douglas Earle Marsh's fine 4-4-2 express engines, and was put to work in December, 1905. Four sister-engines, numbered 38 to 41, respectively, took the road in 1906, and these five engines were known, officially, as Class H1. Mr. Pretty's drawing shows No. 37 in her original condition ; to-day, her appearance is somewhat different, because of modifications carried out after 1922 by Mr. R. E. L. Maunsell, Chief Mechanical Engineer of the Southern Railway until 1937. Nos. 40 and 41 of this class have recently been scrapped ; but the other three engines, which, in the S.R. list, are numbered and named, respectively, 2037, *Selsey Bill* ; 2038, *Portland Bill*, and 2039, *Hartland Point*, are still in service, but on secondary duties.

" DOCKLEAF "

An Experiment in "OO" Gauge

By E.M.E.



Elevation and front end view of " Dockleaf "

THE photograph of " Dockleaf " shows that she is certainly not a beauty ; so the " super-detail " " OO "-gauge fan will probably turn up his nose at her. But there is one respect in which " Dockleaf " can beat the super-details—she sounds and smells like a locomotive and real steam comes out of the funnel. I hope, therefore, the kind reader will excuse her appearance, as she took only eight days to complete (during my leave when in the Forces), and is intended to be merely an experiment.

Object of the Experiment

The object of the experiment was to produce a " live steam " locomotive in 4-mm. scale, with the simplest arrangement of mechanism which bore any resemblance to the prototype, together with reliability and ease of operation. How far the experiment is successful will be left for the reader to judge ; " Dockleaf's " performance is given later in this article.

Choice of Prototype

The prototype had to conform to the following conditions :—

(*a*) It should have side tanks (i.e. a tank locomotive, as it is all in one piece, and side tanks to obscure the burner).

(*b*) It should have outside cylinders (there's not much room for cylinders between " OO "-gauge frames).

(*c*) The boiler should be highly pitched (for combustion space).

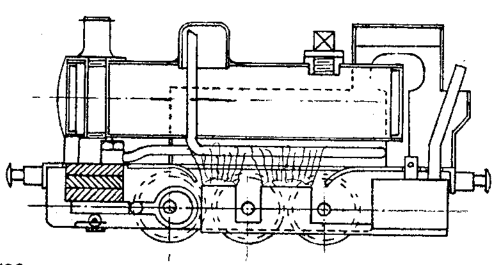
(*d*) Small wheels and short wheelbase (to negotiate sharp curves and give good power —speed is *not* desirable).

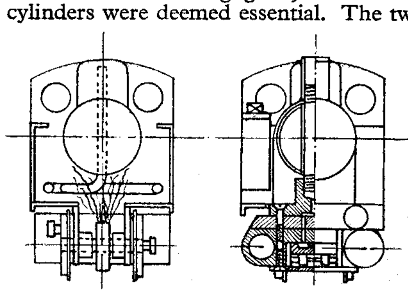
On searching through a book of locomotive drawings, the nearest approach to the ideal seemed to be the L.M.S. " 2F " class tank, used for dockland railways ; hence the name " Dockleaf." It seems that a locomotive must have a name—I cannot recall any unnamed model locomotive appearing in these pages up to now. This prototype has only one disadvantage from my point of view—the valve-gear is outside Walschaerts. This was ruled out in the model for simplicity, although in a later model I have obtained good results from Walschaerts gear in " OO " gauge. Dummy valve-gear could be fitted, but I have a marked distaste of " non-working dummies " which adorn some of the so-called " scale " models.

Design of the Model

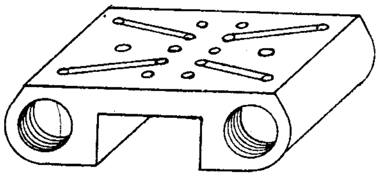
The prototype was drawn out to 4 mm. scale in outline. Full use was made of the space behind the coupled wheels for the methylated-spirit tank. In the photograph it looks rather conspicuous ; but it must be remembered that a lot of fuel is wasted by evaporation as the tank cannot be kept cool. The valves are driven by loose eccentrics on the front axle, so as to leave the maximum possible space for the " axle-dodger " burner.

The cylinder and valve design was the product of much consideration. As the " flywheel " effect on this size locomotive is negligible, two double-acting cylinders were deemed essential. The two





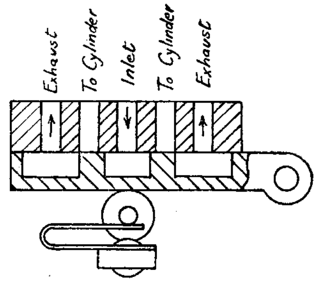
bores were formed in one cylinder block, with the port-faces for the slide valves in between. The rear cylinder-covers are soft-soldered on, the front covers screwed in. To avoid the somewhat laborious and rather nerve-racking experience of drilling a multitude of steam passages, grooves were cut in the top face of the block (see sketch) and enclosed by means of a bolted-on cover-plate with paper gasket. The slide valves are of the *internal* admission type being held to the port-face by a spring. The boiler is a simple " pot " ; the



Sketch of cylinders

large dome of the prototype is very beneficial, although it hasn't got such sharp corners as the model's dome has ; still, I hadn't time to spend on a well-shaped pressing then. There are two coils of steam pipe exposed to the flame to dry the steam. The displacement lubricator (fixed to the front of the side tank—see photograph) is a bit on the large side ; but a smaller one disguised as a feed-pump would be satisfactory.

cylinder. The slip-eccentric and valve-gear were then made and assembled, the timing being checked visually (set to 75 per cent. cut-off). When O.K., a small flat plate was soldered to the valve to close the steam cavities. The wheels were turned from $\frac{1}{8}$-in. brass plate and pressed on the axles. Coupling- and connecting-rods completed



Section through slide valve

the chassis, which was then tested on a cycle pump. It was found to be self-starting in both directions, which augured well for the future.

The boiler barrel was made slightly oversize, as I was not too happy about the water capacity at the time—later I found my fears were quite groundless. With the chassis clamped to the bench, a steam trial followed. This was fairly

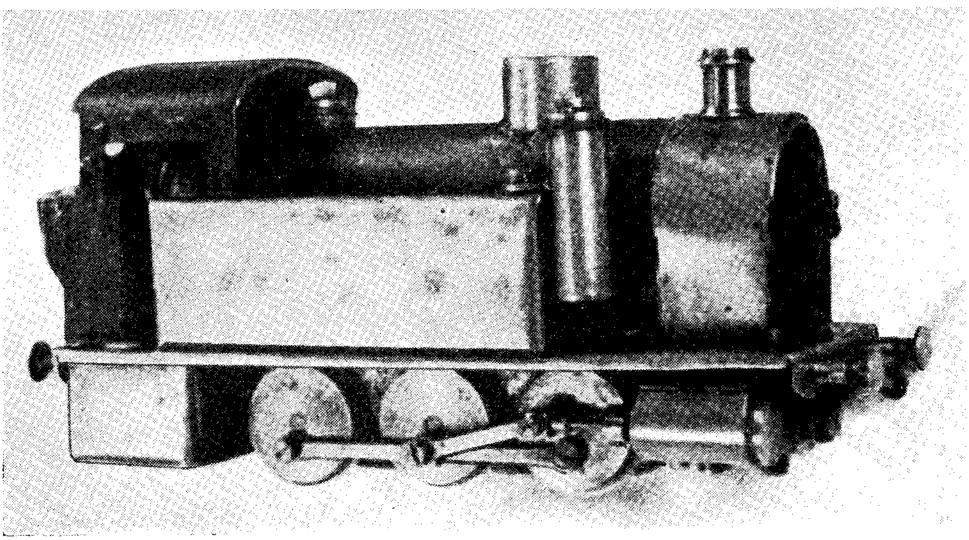


Photo by] *" Dockleaf "* *[M. Stothard*

Construction

The frames were cut from 0.05 in. thick sheet brass, the axles (7/64 in. diameter) running directly in holes therein. The cylinder-block was also machined from a brass block, the cylinders being 7/32 in. bore × $\frac{5}{16}$ in. stroke. The pistons, were also of brass, with a ring of soft packing which, incidentally, is rather a tedious operation to prevent " loose ends " of the packing getting caught up when inserting the piston in the

successful, except for the long time taken to warm the cylinders and expel condensate. Two coils of steam-pipe exposed to the flame improved matters greatly. During this trial, the boiler was fired by a small gas jet and placed adjacent to the chassis, not on it.

The displacement lubricator was then connected to the steam-pipe. The running-boards and superstructure were made from thin sheet brass, and are simple sheet-metal jobs. The

" side-tanks " are permanently riveted to the running-board and lined with asbestos. A gap of $\frac{1}{8}$ in. is left between the boiler and the top of the side tanks for ventilation ; incidentally, with methylated spirit, the smell usually indicates that some of the products of combustion have not " combusted " according to plan.

The boiler was then assembled in its correct position, and just to make sure all was in order, another test run made by directing the gas jet between the frames. The spirit lamp was the next item to be made. The long tube projecting from the container is to carry fumes clear of the flame and prevent the tank catching alight.

Performance

Now all seemed ready for the real test run. A 2 ft. 6 in. diameter circle of " Dublo " track was assembled, the locomotive was prepared for a run, and I eagerly waited to see visible indications of " steam up " (i.e. a slight leakage from the chimney). I had a premonition that things weren't quite right, however, as there was an overpowering smell of unburnt fuel and I had to turn my head each time I exhaled to avoid blowing the flame out. After waiting impatiently for signs of steam, I gently " inched " " Dockleaf " along the track. After spluttering, I did get some steam, but instead of the steam driving the locomotive, the locomotive had to pump it out of the boiler.

The boiler was then raised about $\frac{1}{2}$ in., with great detriment to the appearance, but great improvement in the performance. " Dockleaf " now was able to propel herself unaided. Her progress was accompanied by the smell and blue haze of burnt oil. This was fortunate, as it showed that the superheat was rather more than desirable. The steam-pipe coils were opened out so that the flame could play between them directly on to the boiler barrel, and the boiler lowered to its correct position. The next trial was quite successful ; running light, 100 laps of the 2 ft. 6 in. circle were covered on one filling of fuel ; the superheat, much reduced now, gave the effect I was after—a good visible cloud of white steam from the chimney. The individual puffs were visible and audible at low speed.

A little experimenting with the valve-setting livened the performance up, so much so that a load was necessary to prevent her running away and jumping the track. The best performance at that time was about 100 laps with a load of 8 oz. (representing roughly 200 tons), the length of run being about 10 minutes. The water consumption was surprisingly low, each run consuming only about two teaspoonfuls.

At this stage my leave terminated. I gave the locomotive three or four runs every week-end for the next three months, the performance being fairly uniform until two months had passed. By the end of three months she would only run light. At the first opportunity, the locomotive was completely dismantled. The cause of the poor performance was obvious. The axle " bearings " (i.e. the holes in the frame) had worn to such an extent that the valves had lost half their travel. Brass bushes were fitted to the frame to increase the bearing surface, the valves were re-faced, the pistons re-packed, and the whole lot assembled again. The lamp wicks were renewed, and the greasy accumulation round the wick tube scraped off.

The next trial run showed marked improvement, no fewer than 175 laps being traversed with the same load as before—roughly $\frac{1}{4}$ mile.

" Dockleaf " was again made to run regularly every week-end until the performance again fell off. This time the eccentrics (brass sheaves in steel straps) showed considerable " slop," also the slide valves, in addition to executing motion parallel to the longitudinal axis, also had a component of motion in a sideways direction. The hiss of escaping steam also indicated that a vertical component as well was not beyond the bounds of possibility.

The valve-motion was entirely rebuilt, large eccentric ($\frac{5}{16}$ in. diameter) and straps were made, and both case-hardened this time. The slide-valves were made narrower and guided by vertical pins screwed into the port-face, instead of being allowed to rub against each other and the main frames. The pistons also leaked badly, so the cylinders were due for a rebore. I decided to increase the bore to $\frac{1}{4}$ in.—grossly over " scale " size, but I can hear a cry of approval from " L.B.S.C." if he deigns to read this article on " wrist-watch works." As I had a little more spare time at this juncture, I decided to line the cylinder bore with phosphor-bronze, and use stainless steel solid pistons. The axle-bearings, incidentally, were still in very good condition, with scarcely any perceptible slack.

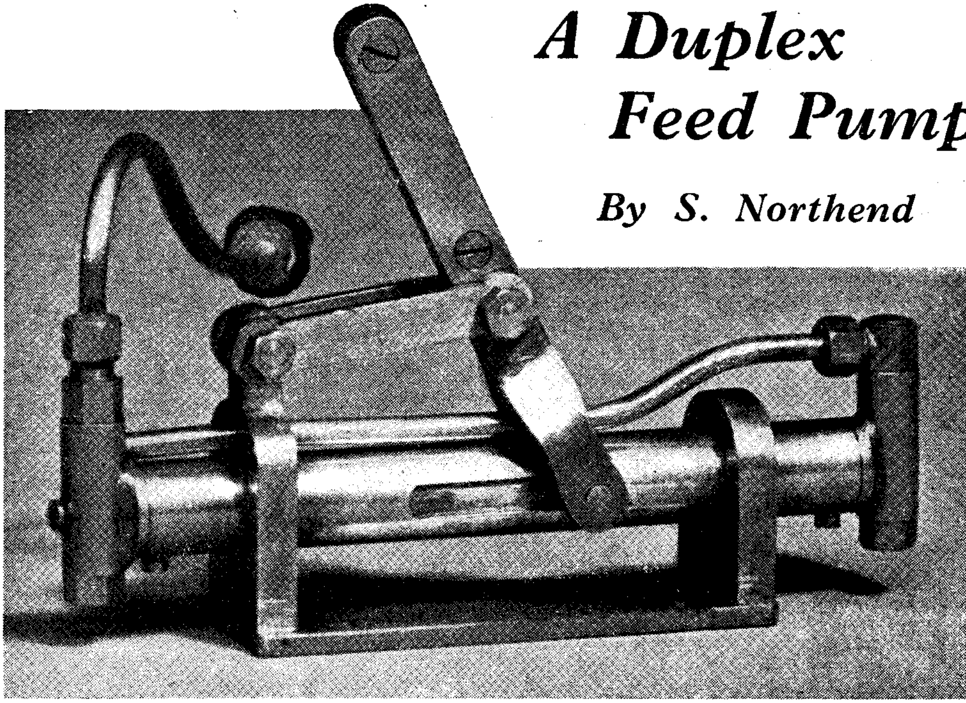
The next trial run certainly showed a better tractive effort, as a load of 18 oz. was sustained for 100 laps. Considering the flange friction due to the sharp curve, I would estimate that, on a good level straight track " Dockleaf " could manage about 2 lb. The length of run of 100 laps, instead of a previous figure of 175 laps, was due to a fault in the lamp, because, when the lamp went out, there was still a considerable amount of fuel left. It is probably only a matter of attending to the wicks to rectify this, but since, at the time of writing, no further work has been done on the locomotive, the account of performance must finish here.

Future Plans

The water capacity of the boiler is sufficient for about three runs, therefore a smaller boiler, well lagged, would improve efficiency considerably. To enable the locomotive to be used on a track with varying gradients, some form of control is necessary. I am inclined to favour a dashpot type of control, i.e. a cylinder with loose piston driven by a crank from the axle, with oil as the retarding medium. This device would give a resistance characteristic proportional to the square of the velocity, which would keep the latter within reasonable limits.

ABRASIVE TOOLS LIMITED

This firm is one of our regular advertisers, and we have been advised that they have recently taken over all manufacturing rights in the Davies tension file. Abrasive Tools Ltd. are the original and only makers of tension files in this country, and all trade and other enquiries should, in future, be made to them.



A Duplex Feed Pump

By S. Northend

HAVING only a 40-ft. track and thereby a very thirsty locomotive, some time ago I considered the question of more water per minute for the emergency pump, as I had not the time to install an injector. The pump described soon became a real 100 per cent. improvement on the orthodox "village pump" type ; it takes very little more time to make and piles the water up the glass very quickly. The following brief description should enable anyone interested to make a similar pump.

Two pieces of $\frac{1}{4}$-in. brass, 1 in. wide, bored and reamed for the barrel, are screwed and sweated to a baseplate $3\frac{1}{4}$ in. long by 1 in. wide. The barrel is a piece of $\frac{9}{16}$-in. brass tube $4\frac{3}{8}$ in. long. $\frac{3}{16}$-in. slots, $1\frac{1}{4}$ in. long are cut at the centre and the barrel sweated into upright pieces, slots midway between. The ram is $2\frac{3}{4}$ in. long, grooved and packed near each end, and drilled and reamed $\frac{3}{16}$ in. at the centre to coincide with the slots in barrel.

A gudgeon-pin of rustless steel $\frac{3}{16}$ in. diameter is reduced to 5/32 in. at each end for $\frac{1}{8}$ in. On to these spigots are fitted two pieces of $\frac{3}{8}$ in. $\times$ $\frac{1}{8}$ in. brass rod, bent at the bottom to form a fork, clearing the barrel each side, and screwed together with countersunk screws, over which slides usual extension handle.

Valve-boxes are fitted with $\frac{3}{16}$-in. balls ; they are a press-fit into the barrel and are secured with two small screws. From the delivery end of one a 5/32-in. pipe is fitted with union and nut above the ball and runs along top of barrel, through the hole in the upright plate to the side of the delivery-chamber at the opposite end, and sweated in. Above this, a coned union and nut carries a single 5/32-in. pipe delivering to the boiler both supplies alternately. The length of the anchor-links should bring the lever vertical, with the ram at mid-stroke.

Mechanical advantages are :—

1. The ram is supported whole length, giving a smooth, shuttle-like action.
2. Delivery pressure from either end holds down the balls during the suction-stroke, either end.
3. Doubles the amount of supply per minute.

Bore and stroke, $\frac{1}{2}$ in. $\times$ 1 in., can be made according to requirements, and the complete pump can be dismantled in a couple of minutes.

KENNION BROS. PRICE LISTS

We have recently received from Kennion Bros. (Hertford) Ltd., copies of two welcome price lists. One gives full particulars and prices of blueprints, castings and parts for a number of $2\frac{1}{2}$-in., $3\frac{1}{2}$-in. and 5-in. gauge locomotives, most of them well-known designs by "L.B.S.C."

The other list covers a wide range of tools, materials and sundries useful to all model engineers. Each list costs 6d., which will be refunded on the first 10s. 0d. order. We have also inspected many of the items produced by this enterprising firm, and feel that we can confidently recommend them to our readers.

QUERIES AND REPLIES

Enquiries from readers, either on technical matters directly connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by a stamped, addressed envelope, and addressed "Queries and Service," THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases, the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of a specialist, or outside consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

No. 8009.—Compressor for Spray Painting. J.C.G. (Sutton)

Q.—I wish to build a small air compressor to operate a spray gun. I have the gun, smoothing tank, and electric motor. I have, as the basis for the compressor, a crankshaft, con-rod and piston of 2-in. bore and $1\frac{1}{2}$-in. stroke, but I have never seen the internals of a compressor and have no idea of the valve gear.

Could you give me any instructions for making a simple compressor, or inform me of where to obtain plans.

R.—An air compressor, being simply an ordinary pump, is usually fitted with suction and delivery valves, which work automatically, opening inwards and outwards respectively. Various types of valves are used, but it is generally desirable to make them as light as possible, to facilitate rapid and efficient action. If a high delivery pressure is required, the clearance in the cylinder must be reduced to the minimum, and this may call for specially designed valves. A petrol engine can be converted to work as an air compressor simply by fitting suitable valves to the head; in the case of a two-stroke engine, a fairly successful result may be obtained by substituting a delivery valve for the sparking plug, and using the original exhaust port as an air inlet.

We regret that we cannot advise you where to obtain drawings of an air compressor at present.

No. 8010.—Design for Rotary Magnet. H.C.W. (Morden)

Q.—I have for some time been toying with the design of a magneto of the revolving magnet type, and seek a word of guidance on the all-important question of magnet design.

Enclosed herewith is a sketch of a magnet (not reproduced), that, if considered as being technically sound and efficient, would help me to solve my constructional problem. The material would have to be in itself highly efficient, such as "Alnico," and I would be grateful if you considered the proposed shape as being one that would make for "best magnet proportions for a given type of steel."

R.—The type of magnet illustrated should be quite efficient in Alnico or similar steel, but you do not indicate the direction of polarity, or the positions of the poles. The magnet could be magnetised either through the axis or across the diameter; I presume you intend it to be in the latter direction, but in a plain cylindrical magnet, we recommend the fitting of soft iron pole pieces, to produce well-defined polar angles and a clean breakage of the flux as they leave the stator poles. Some machines have been made to work successfully with circular magnets, but we do not recommend them for highest efficiency with a limited size of magnet.

No. 8011.—Valves for Air-Compressor. A.B. (Atherstone)

Q.—I have made an air compressor of $1\frac{7}{8}$-in. bore and $2\frac{1}{4}$-in. stroke, but I am very uncertain about the inlet and outlet valve design. Several attempts have never quite produced a satisfactory result. I understand these valves are usually of the flat disc type. Can you tell me the tension and seating areas of valves for the above cylinder?

R.—The design of valves for air compressors depends very largely on the type of compressor. and the duty for which it is intended to be used. General-purpose compressors of small size have sometimes been fitted with simple ball valves, with a light spring loading on the delivery valve only, but the inertia of this form of valve renders it unsuitable for really high speed. Disc valves are capable of operation at much higher speed, but for continuous work at high pressure, "mushroom" valves (inverted in the case of the delivery valve) are more efficient and durable. A variation often used for the delivery valve is the "thimble" type of valve, which can be made extremely light, and having the spring inside, offers the minimum obstruction to the air flow. Reed valves of specialised type are often used in large compressors.

For a compressor of the size specified, running at speeds up to about 800 r.p.m. the valve seatings should not be less than $\frac{1}{2}$-in. clear bore diameter. Spring loading should only just be sufficient to seat the valve efficiently at the maximum speed; the exact strength of spring required to give best results can only be found by trial. It is hardly practicable to give you more definite advice without more exact knowledge of the type of compressor you are building, including drawings of the head.

Letters

Small Turbines

Dear Sir,—The recent letters from Mr. Elkin and Mr. Harris on the relative steam consumption of small turbines and reciprocating engines have prompted me to carry out some tests on a small single-cylinder double-acting slide-valve marine engine. The results may be of interest to readers, as I do not remember seeing any similar figures published.

The engine has a bore of ¾ in. and a stroke of ⅝ in. and is supplied by a pot boiler 6½ in. × 2¼ in. The superheater is a length of copper tube fixed between the boiler and the casing and part of it comes in direct contact with the flame. When used in a boat, the boiler is fired by a vaporising spirit lamp and, starting with 10 oz. of water, it will drive a 3-in. propeller at about 1,000 r.p.m. for half an hour.

For the tests, a gas burner was used, as it was more convenient for regulating the pressure. The brake consisted of a light belt, round the flywheel, loaded with weights. It was found quite easy to maintain equilibrium without the use of a spring-balance, but as the flywheel is only 1½ in. diameter a minimum speed of 1,500 r.p.m. was desirable.

The method of procedure was as follows. The engine was given a preliminary run to warm it up. Then the boiler was filled with a known amount of water and steam raised. As this took some minutes, there was some condensation before the engine would run, in spite of the previous warming, and it was found necessary to deduct ½ oz. from the amount in the boiler to allow for this. Time was taken from the starting of the engine until the water was all used up. This gave the steam consumption per minute. Speed was kept constant at either 1,500 or 2,000 r.p.m. during each test. This was done by having either four or three white marks on the face of the flywheel and observing them with a neon lamp.

In the later tests a pressure-gauge was fixed to the steamchest, and I was surprised to find such a big drop from boiler pressure. This seems to show that linking up would be a much more efficient way of controlling speed than throttling, which was done in this case. The results are given in the table below.

The engine was built a good many years ago and was naturally somewhat out of adjustment; so, after test 1, the valve was examined and the port openings were found to be unequal. This was corrected; but, as the cut-off was 75 per cent., extra lap was added to reduce it to 50 per cent. The remaining tests were made with this setting.

Test 2 was made with no load and shows what a big proportion of power is absorbed in merely turning the engine round, although there is apparently very little friction.

If possible, errors are taken into account; I think the results are correct to within 10 per cent. either way. They show that a reciprocating engine using the same quantity of steam as Mr. Elkin's turbine gives about 50 per cent. more power. Nevertheless, I think Mr. Elkin is to be congratulated on having raised the efficiency of the small turbine to such an extent that it becomes a practical proposition for propelling boats. I hope he will be still further successful.

Yours faithfully,

Stockport. G. Lindsey.

No. of test	Boiler pressure	Steam chest pressure	Speed r.p.m.	Steam consumption, oz. p. min.	H.P.	Lbs. Steam p.h.p. hour	
1	60	—	1,500	0.67	0.020	126	Before valves adjusted
2	65	15	”	0.28	No load	—	After valves adjusted
3	60	35	”	0.56	0.021	100	”
4	70	35	”	0.68	0.026	98	”
5	75	40	2,000	0.77	0.028	103	”

Locomotive Tyres

Dear Sir,—Quite why Mr. Woodcock should be led to doubt the quality of my training and experience because I showed only one of the most common types of tyre fastening in my notes I don't see. I was endeavouring to illustrate a general principle, not to write a thesis on locomotive tyre fixing.

There are at least a dozen different ways of securing locomotive tyres, probably half of which show a rim or step at the back; there is, too, at least one other method besides that shown by Mr. Woodcock in his left-hand sketch which shows a flush front. The point at issue was that hardly any of the locomotives entered for competition indicated a tyre on the front of the wheel, and so far as I can remember none did so on the back; amongst these there were a number of models of G.W.R. engines and others which should show both.

Yours faithfully,

"The Writer of the Article."

Baker Valve-gear

Dear Sir,—I was very interested to see Mr. K. N. Harris's article on the early evolution of the Baker valve-gear. I have been spending a little time lately studying the sources of error in the original Hackworth valve-gear and applying the results to get correct—by which I mean symmetrical—distribution in Joy and American Southern gear.

Mr. Harris asks what is the best steam distribution? A very nice question to ask early in the

evening if you are quite sure you will not be thrown out till midnight! It seems to me that the answer falls under three heads, each of which is open to plenty of argument.

1. Is constant lead desirable? If not, what variation should be provided and should it be automatically linked with the cut-off as in Stephenson's link motion? Incidentally, I have always understood that the difficulty about the increasing lead of the Stephenson gear is that it is liable to be accompanied by earlier compression, thus causing back pressure.

2. What is the correct ratio between lap and lead? 6 to 1 as on L.N.W. "Lady of the Lake," or 13 to 1, as on Churchward's G.W. engines? What about exhaust clearance?

3. Should the motion of the valve be harmonic as with a simple eccentric with a long rod? or should we deliberately aim to speed up the travel at the end of the stroke, as, for example, by the use of Reikie's combination lever, so as to get greater openings at short cut-offs. I have always understood that Baker's gear had something of this feature, and the claim that it is superior to Walschaerts is based on this aspect of the case.

Yours faithfully,
Rugby. JOHN H. REYNOLDS.

Model Traction Engine

DEAR SIR,—In reply to Mr. Alan Blount's remarks published in the February 13th issue, I did not put in the compensation oval piece and pin to the rear road wheel hubs, due to the fact that they were castings and were intended for a scheme I had in mind, and I hope in the very near future to build up a set of wheels for this engine. The upright lever was fitted for convenience and I fancy some engines of this type were fitted with this type of regulator.

Yours faithfully,
Norwich. G. R. CROSS.

Clubs

Kent Model Engineering Society

A very interesting evening was spent on Monday, March 3rd, when Mr. Lister brought his electric welding plant and gave a practical demonstration with same; he afterwards invited members to try their hand, which was eagerly accepted.

Secretary: A. F. BROCK, 342, Green Lane, New Eltham, S.E.9 (Telephone: ELT 2342).

Edinburgh Society of Model Engineers

A large turn-out of members visited, on the evening of February 12th, 1947, Portobello Power Station and were conducted round the plant by Messrs. Hagan and Murray, to whom we tender our thanks. On Saturday, February 22nd, Mr. Smith, worthy secretary of the Glasgow Society of Model Engineers, gave us a very interesting talk on the Model Locomotive he is at present building, and the lecture was appreciated by all.

The workshops at No. 2 Ramsay Lane are open on Tuesday evenings at 7.30 p.m. and Saturday afternoons at 3.15 p.m. and all interested are made welcome.

Hon. Secretary: JAMES H. FARR, Wardie Garage, Ferry Road West, Edinburgh, 5.

Sale Model and Engineering Club

On Monday, February 3rd, Mr. E. Axon gave a talk on "Costs and Data of Oxy-acetylene Welding as related to use in the model engineer's workshop." He brought along a Type DH blowpipe, together with the necessary regulators, nozzles, pipes and goggles, etc., manufactured by The British Oxygen Co. Ltd., and these aroused great interest. A description of the construction of a cheap welding hearth was given and a detailed account of the brazing up of the boiler for a 1¾-in. scale steam roller, using silicon-bronze filler rods and "Easy-flo" brazing metal. Mr. Axon concluded with a description of the use of oxy-acetylene for that present-day very necessary evil—car repairs, with details of repairs to a cracked cylinder-head. After the interval for refreshments, Mr. Axon answered numerous questions and the meeting closed with the feeling that, very shortly, the Sale Model and Engineering Club would have several members equipped with oxy-acetylene.

February 17th was an open night, when members were invited to bring along models under construction, and informal discussions took place.

Monday, March 3rd, was devoted to a film show, when the following films, kindly loaned by the Petroleum Board, were shown:—A.B.C. of Oil; The Petrol Engine; The Compression-ignition Engine; Lubrication. The projector was kindly loaned and operated by one of the members, Mr. T. Forster.

Visitors are cordially invited to our meetings, held fortnightly at our club-room, "Inglewood," Wardle Road, Sale, at 7.45 p.m., and a special invitation is extended to junior visitors (under eighteen years).

Hon. Secretary: J. H. S. WILLIAMS, 154, Park Road, Timperley, Manchester. (Telephone: Sale 5486.

North London Society of Model Engineers

Despite the very severe weather, meetings have been well attended. It may be of interest to note that during February nine meetings were held, viz.: one general meeting, four miniature railway, one boats and yachts, one model cars, one locomotive section, one aeroplane section.

The April general meeting is at 8 p.m., on April 11th, at the offices of The Barnet District Gas & Water Co., Station Road, New Barnet, and takes the form of an "Under-Construction-Just-Finished" Exhibition.

Hon. Secretary: N. M. DYER, 97, Selborne Road, N.14 (Tel.: PALmers Green 2414).